

BIGGEST CAR CRASH—How It Happened

POPULAR SCIENCE

APRIL • 35c

Monthly

NEW Yard Machines *Turn Work into Play*

PAGE 72

LEAF VACUUM

PRIME MOVER

LAWN SWEEPER

FLEXIBLE DRIVE

SOD AERATOR

POWER HOE

BABY BULLDOZER

WORKING PLANS:
**Build Your Own
Hot-Air Engine**

new! 2 DRILLS IN ONE



MODEL
328-01

\$27⁹⁵



WOOD



METAL



CONCRETE

***Cummins* DUO-DRILL**

Gives you the right speed for the job
Handles both $\frac{1}{4}$ " and $\frac{3}{8}$ " drilling range

If you've ever been handicapped by a $\frac{1}{4}$ " drill that lacked power for $\frac{3}{8}$ " drilling service — or a $\frac{3}{8}$ " drill that lacked speed for $\frac{1}{4}$ " drilling — here's the wide drilling range you need for all home maintenance jobs! Cummins new Duo-Drill with *self-compensating* speed range adjusts to correct speed for drilling in metal with either $\frac{1}{4}$ " or $\frac{3}{8}$ " bits! Drill up to 1" diameter in wood... work with carbide-tipped bits in stone, concrete. Compact pistol-grip design; Jacobs geared key chuck; precision-cut, hardened heat-treated steel gears! Two drills in one!



Cummins

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just wipe to re-tin this NEW alloy tip!

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exclusive vibration-free drive!

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THE CASE IS YOURS at no

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START TO FINISH... IN "HARDWARE WEEK" POWERHOUSE



Cummins

727-01 MAXAW

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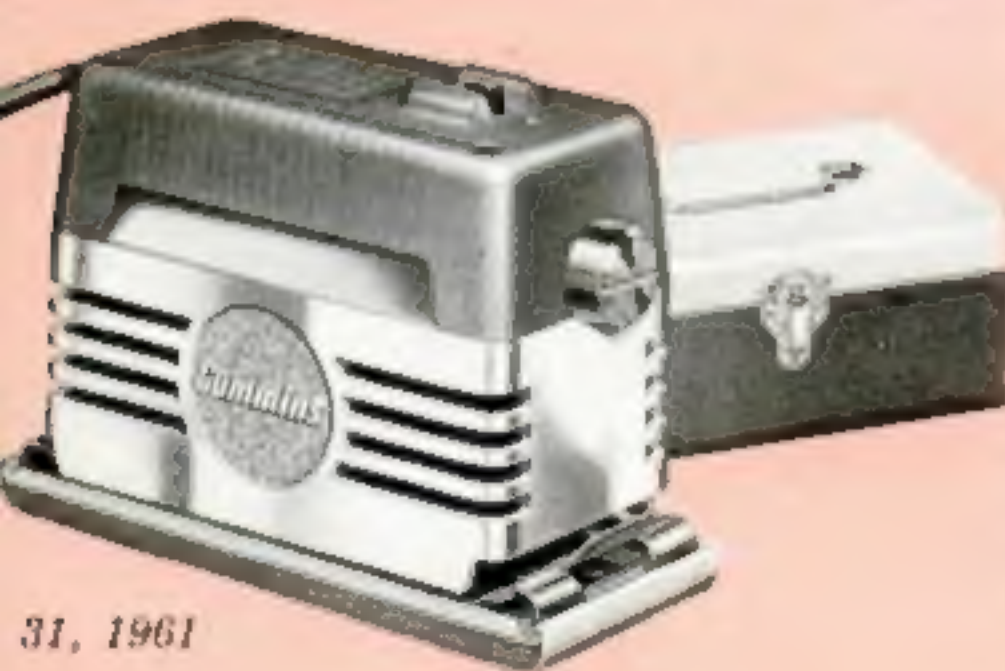
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31, 1961



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Trouble: *The line is open for a helping hand. P. 84*



Inventing: *You've got a great idea but is it new? See P. 115*



Smashup: *No war—just 34 cars colliding. P. 90*

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April, 1961

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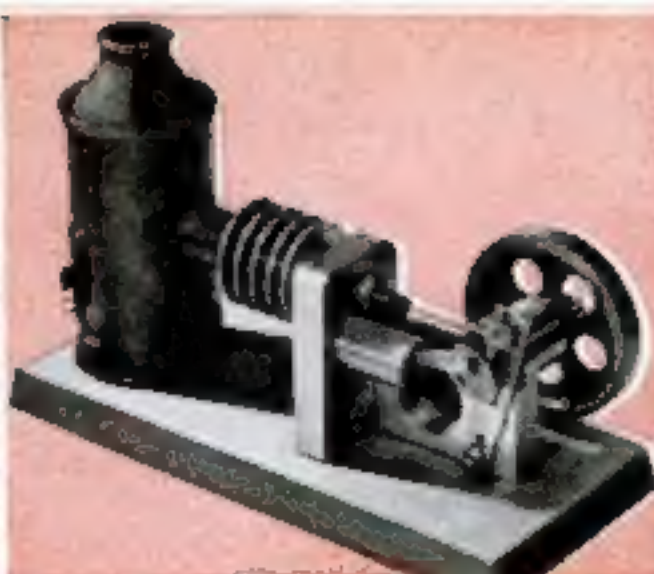
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Hot-air engine: *How to build this sweet little job. P. 142*



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PS Readers

TALK BACK



More on Speedometer Rigging

JUST finished reading about how to look for signs of tampering with odometers ["Can We Stamp Out Speedometer-Rigging?" Jan.]. This is no longer done by hand—it's too expensive.

A used-car dealer I know has a little black box operated by electricity. The speedometer cable is disconnected from the transmission and plugged into the box to turn back the reading. This costs the dealer about \$1 per car (\$6 if the speedometer is removed).

Q. CHARLES HOWARD, Houston, Tex.

... LAST July I traded in a car I'd driven 28,000 miles in less than a year. The dealer offered me a "good deal" if I'd tell any customer who might call me that it had been driven only a few thousand miles. I refused. Later he offered me the same deal without conditions and asked that I forget that he'd ever suggested misrepresentation. While my car was for sale on his lot I checked the speedometer and found it had been reset to less than 10,000 miles.

This was not my first experience. Several years ago I bought a good-looking car from a dealer only to discover, after many troubles, that the car had been in a flood and had been purchased as a junk car not to be resold. Both transactions were with most "reputable" dealers. It may be well to buy only from an honest dealer, but how do you determine this pleasant fact?

K. R. HOPKINS, Bethlehem, Pa.

... WHEN we traded in our 1959 car, the new 1960 car had the odometer cable disconnected and ashes were in the ash trays. It showed 23 miles but had at least 100 miles on it. After the deal was completed, they turned back the 1959's

odometer from 20,000 to 8,000 miles, lopping off 60 percent of its true mileage.

STEVE BOREN, Highland Park, Ill.

... BEING familiar with odometer rigging—I did it before I joined the AF—I'll back you up on the nine rules to follow when buying a used car. I don't think I ever replaced an odometer just as it came out. In fact, I think it would be impossible.

I moved from lot to lot, carrying my little box of tools. What was my answer if a customer asked what I was doing? "Just replacing dashboard lights."

When you go to buy a car, add rule 10: Drift back to the rear of the lot and look for a note under a windshield wiper or a man on his head with his feet in the air. If you see anything like this, your best move is to the next lot.

NAME WITHHELD, Goldsboro, N. C.

Are the Fair Ever Fair?

You should demote if not defrock Joan Steen, your Puzzle Editor. I personally would like to attend a dawn ceremony stripping her of epaulettes to a

roll of ruffled drums—because of a wholly unfair puzzle.

I refer, of course, to that perfidious one about the three houses and the three wires that may not intersect [Jan.]. I read this puzzle with enthusiasm. Here at last, I thought, is a puzzle that doesn't call for a cross between an idiot savant and a square-root hog.

In a short time it became evident that the puzzle is insoluble. Something wrong here, I thought. For three days I rechecked that puzzle, stopping only for



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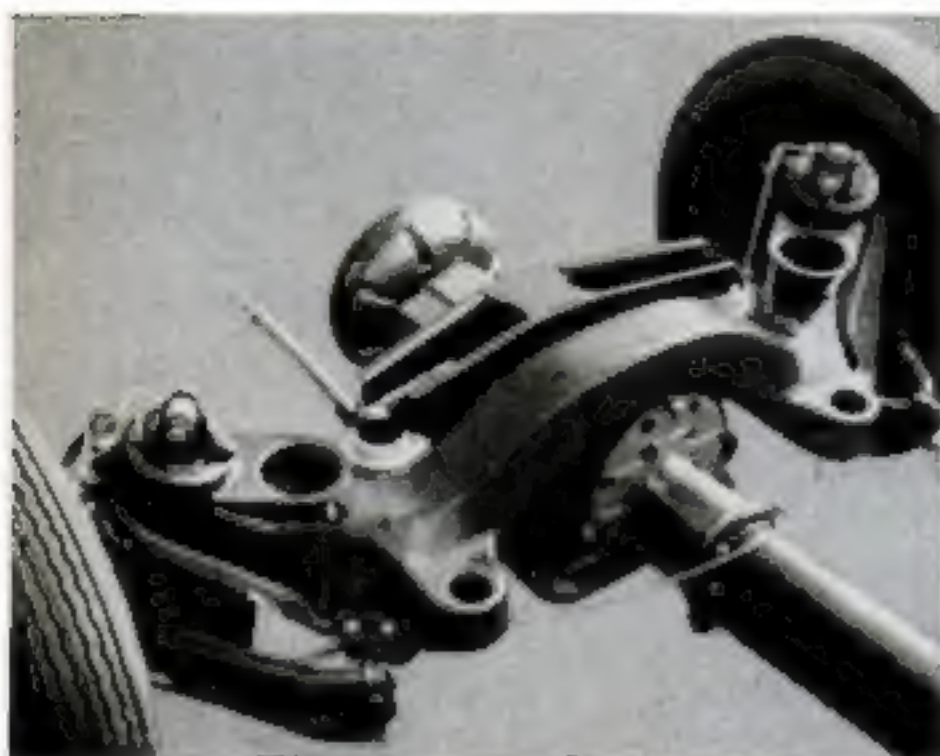
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ANSWERS: 1. Transaxle (illus: 1961 Pontiac Tempest).

2. Complete engine protection.

QUAKER STATE OIL REFINING CORP., OIL CITY, PA.



brief rest and nourishment. Then, despairing, I turned to the solution.

What do I discover, expounded in a peal of unprincipled laughter? That the puzzle is soluble only if you run a wire through one of the houses! Great balls of fire!

CALVIN PERKINS, Readfield, Me.

Southern Hospitality

YOUR test of the Olds compact ["10,000 Miles in an F-85," Jan.] was most interesting. The little sidelight on the radar trap in Virginia particularly amused me.

Last summer my family and I were driving through Virginia, pulling a seven-foot camping trailer. On a four-lane highway, I was trying to stay within the 45-m.p.h. speed limit for a towed vehicle, but found trucks passing me right and left. Finally, I decided that no one paid attention to the posted speed and stepped it up to 55.

My next stop was a roadside farmhouse where a charming lady JP relieved



me of \$17.25. The trooper admitted that the speed limit was ridiculous, that it didn't bother the big trucks, but that it brought in a lot of revenue from out-of-state.

MERRITT LETSON, Waterloo, Iowa.

Lay Down That Hammer

NEVER use a hammer to tap connections on a battery ["Hints from the Model Garage," Jan.]. If a clamp has to be tapped down, use something light like the handle of a screwdriver. Best of all, remove the bolt (replace it if acid has eaten 10 percent of it), clean the terminal and post, and grease with vaseline or light grease. Spread the battery terminal with a screwdriver if it won't fit easily.

H. E. WRIGHT, N. Augusta, S.C.

Science Catches Up

"WHY does one cell multiply unaccountably to become a tree, while an-

CONTINUED

ME—in a Rut? —COULD BE!

YES—you may be in a rut—just getting by—and not fully realizing it.

Every day you stay in that rut you "dig deeper"—make it harder and harder to get out.

So today while you think of it, take stock of yourself—are you getting ahead as fast as you should—are you satisfied to go along in a small job at low pay the rest of your life?

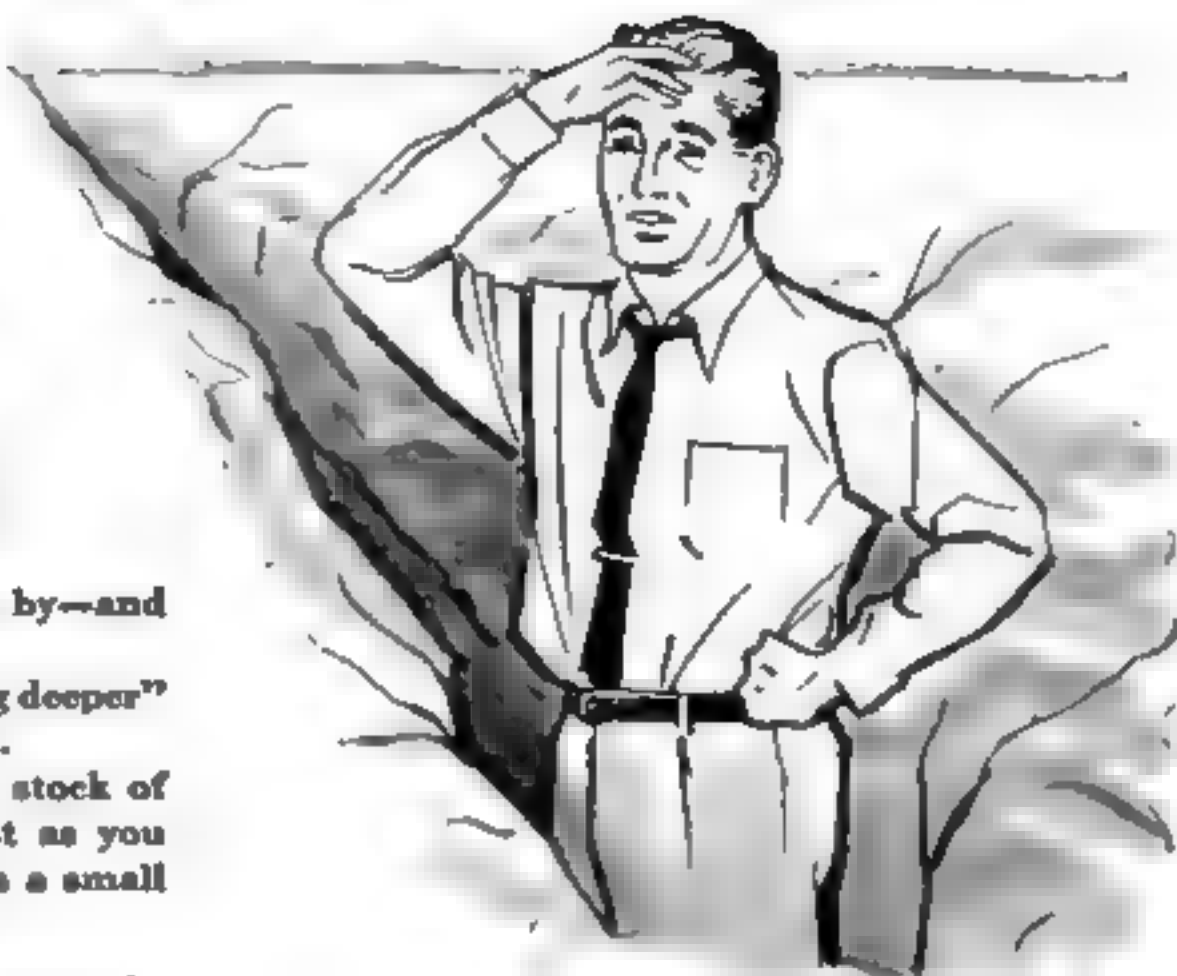
You can justify a real pay raise and a better position—by making one simple move—the move that opens the way to more earnings and promotions—*practical training*.

If YOU are "standing still" on your job—no promotions—only token increases in pay—then you had better do something about it. You know that if you are untrained, your chances of getting ahead are slim. NOW IS THE TIME TO PREPARE.

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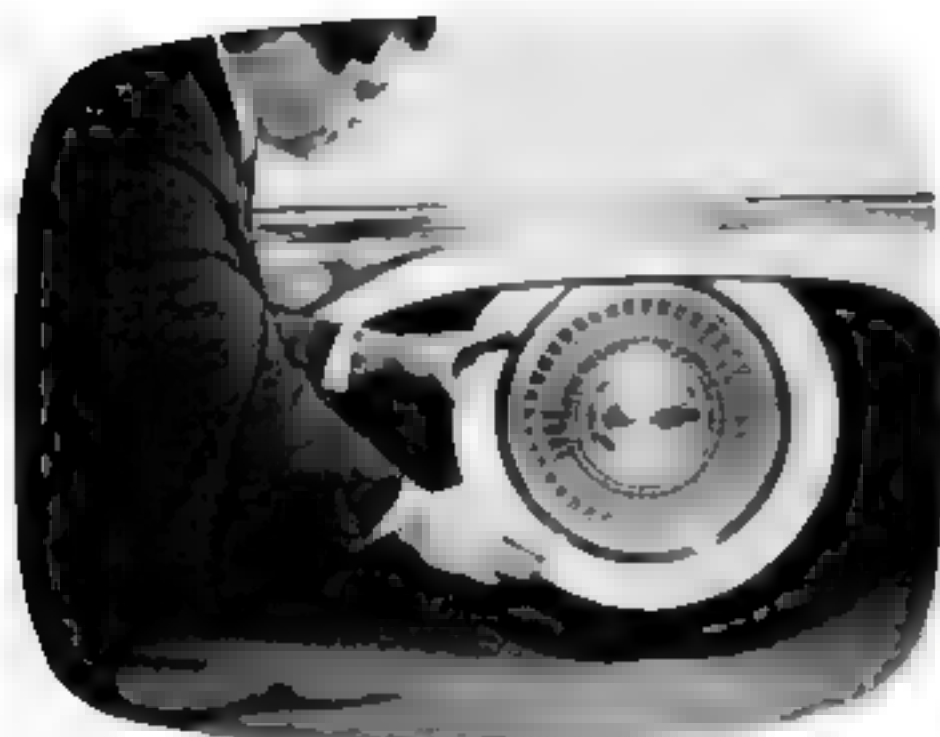
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TODAY...SURE!**

TV's Professor Jonathan Karas shows why

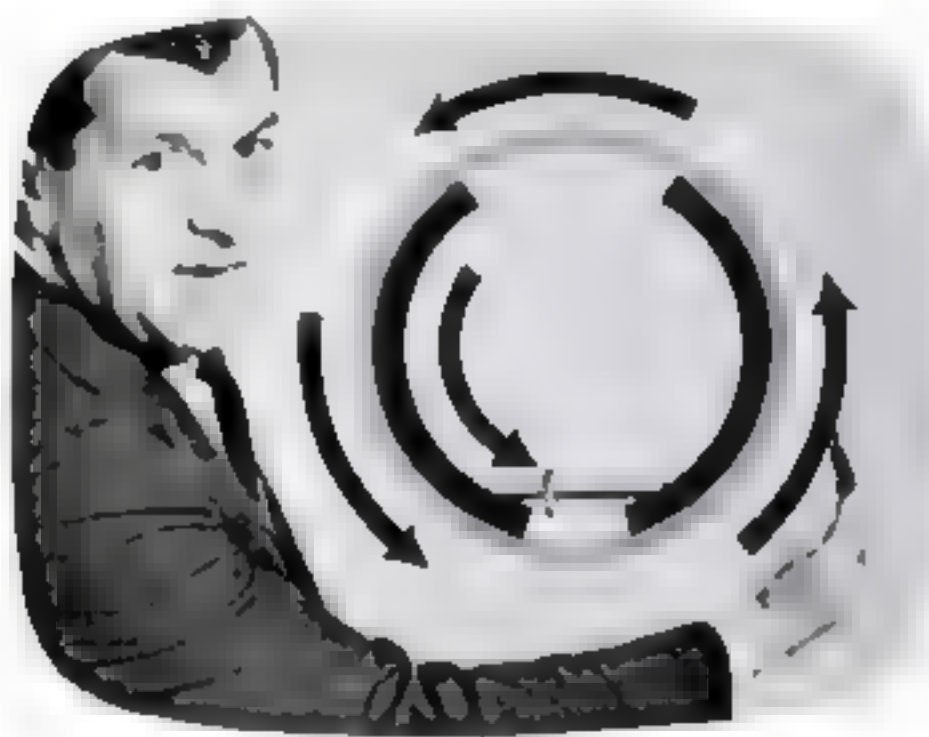
The brakes



Professor Jonathan Karas, physicist at Lowell Technological Institute, uses a rifle to demonstrate—as he does on Ford's TV shows—a remarkable feature of the '61 Ford.



3. "This principle of harnessing existing energy is employed in the brake system on the '61 Ford. When linings wear down, they no longer have to be adjusted by hand!



4. "In stopping a car, the brake shoes are not only forced against the drum, but the whole assembly tends to shift slightly in the direction the wheel is rolling.

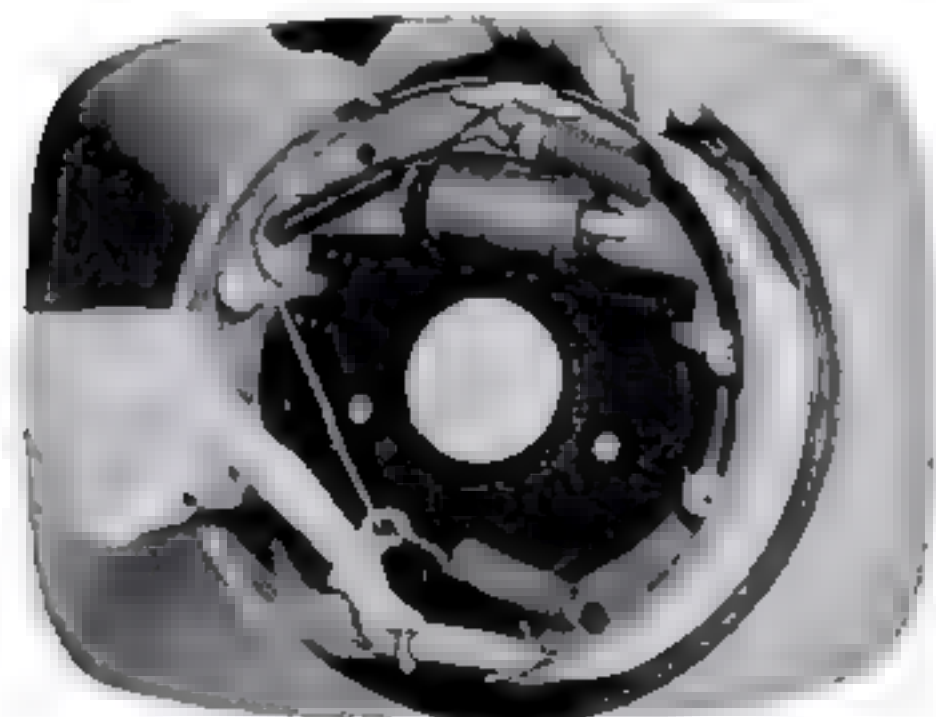
on the 1961 Ford adjust themselves automatically



1. "Here are two types of rifles. One is a bolt-action, the other an automatic. The automatic does one particular job that has to be done manually with the other rifle.



2. "It uses its own energy to eject one shell and introduce another. This is a perfect example of harnessing energy that would otherwise go to waste.



5. "Ford uses this motion (and energy) to adjust the brakes while in reverse. It turns the adjusting nut when necessary, doing the job *automatically and more precisely* than by hand.



6. "Self-adjusting brakes . . . 30,000 miles between chassis lubrications . . . 4,000 miles between oil changes! All are features of the '61 Ford, *beautifully built to take care of itself!*"

1960 version, Ford Motor Company.

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LUFKIN

SAGINAW, MICHIGAN

other becomes a man? In the beginning the cells are remarkably alike, yet the results are extraordinarily different. Inside the cell must be a master control that dictates all subsequent growth. The astonishing thing is this: The master control is the same chemical in all living things. It differs only subtly between men and trees. Yet this tiny difference makes men men and trees trees" ["The Month in Science," Jan.].

"And what you sow is not the body which is to be, but a bare kernel, perhaps of wheat or of some other grain. But God gives it a body as He has chosen and to each kind of seed its own body. For not all flesh is alike, but there is one kind for men, another for animals, another for birds, and another for fish" [Letter of St. Paul, I Corinthians 15:37-39].

JOSEPH DOWELL, Houston, Tex.

A Pershing Should Know

DESCRIBING the XM79 ["Army's New 'Shotgun' Launches Grenades," Jan.], Alex Markovich gives it a *maximum* range of 435 yards at a 30-degree angle. As far as I know, any projectile has a maximum range at 45 degrees. Working it out according to formula, I'd say that the launcher has a maximum range of about 500 yards at 45 degrees.

MICHAEL PERSHING, Glencoe, Ill.

For reasons of safety and accuracy, the launcher is not designed to fire at elevations above 30 degrees.

Flushed with Victory

Two days before my January PS arrived, Junior dropped a toothbrush into the toilet bowl. By following one of the



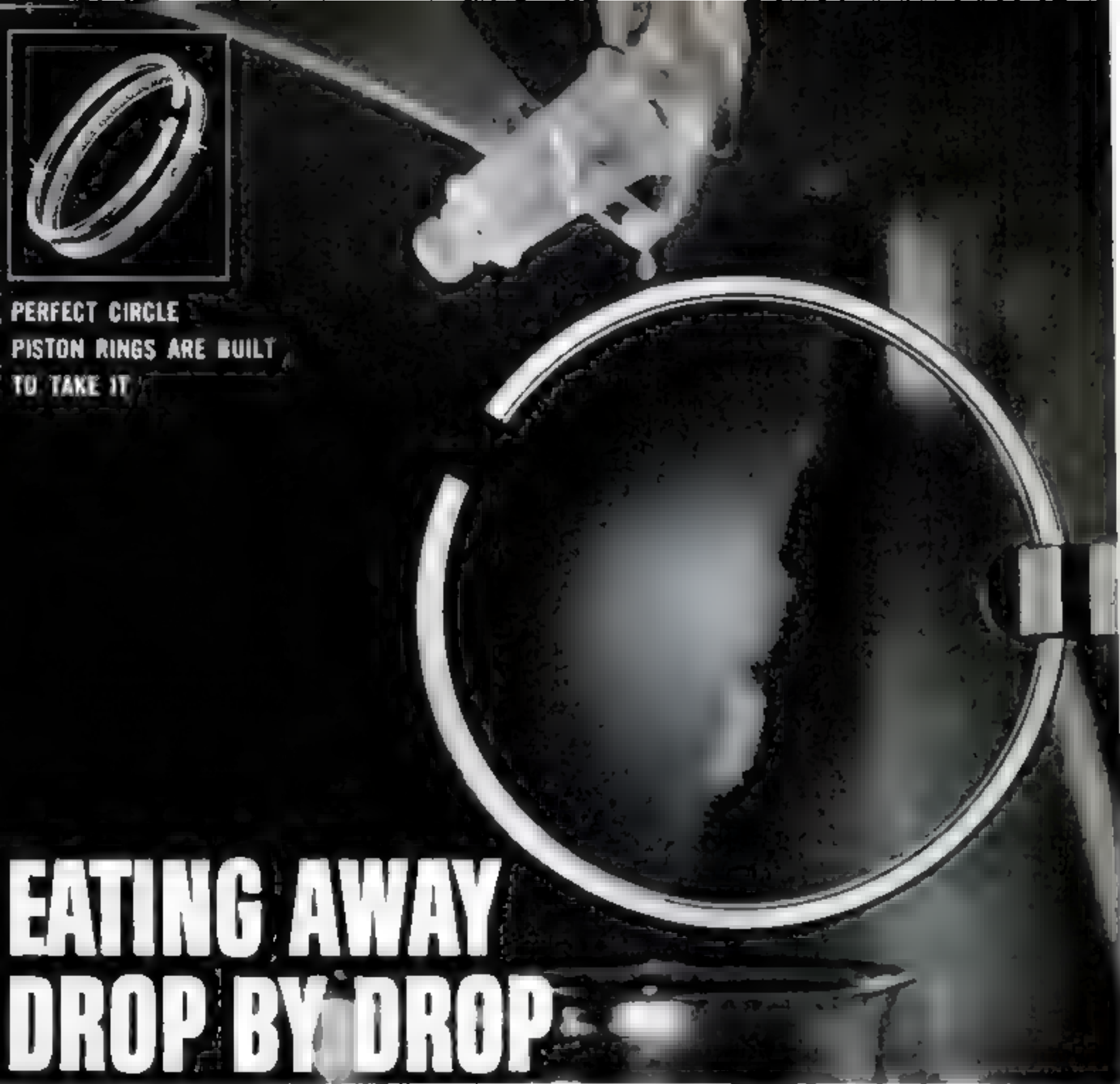
"Short Cuts and Tips" you printed, I was able to hook and retrieve the obstacle. Many thanks.

F. D. KACIR, Warren, Mich.

Who Launched the Quail?

IN "Our Secret Radar War with Russia" [Jan.] a caption says that "the Quail

CONTINUED



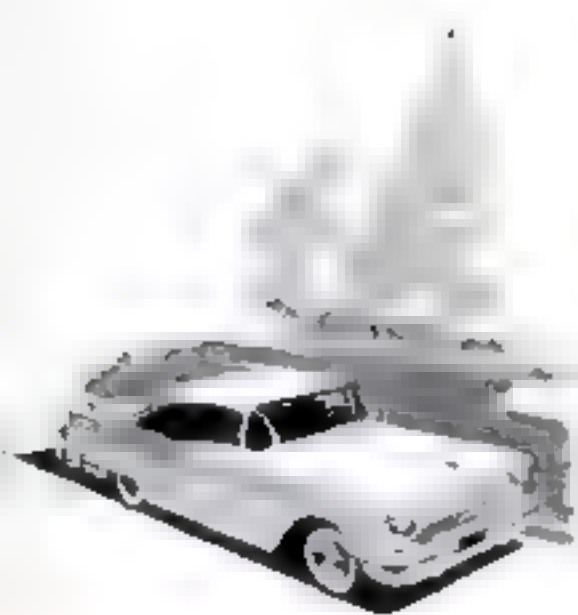
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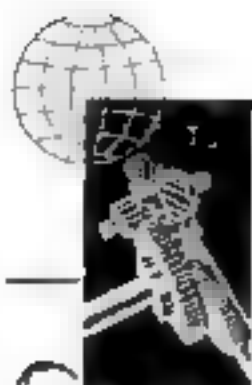
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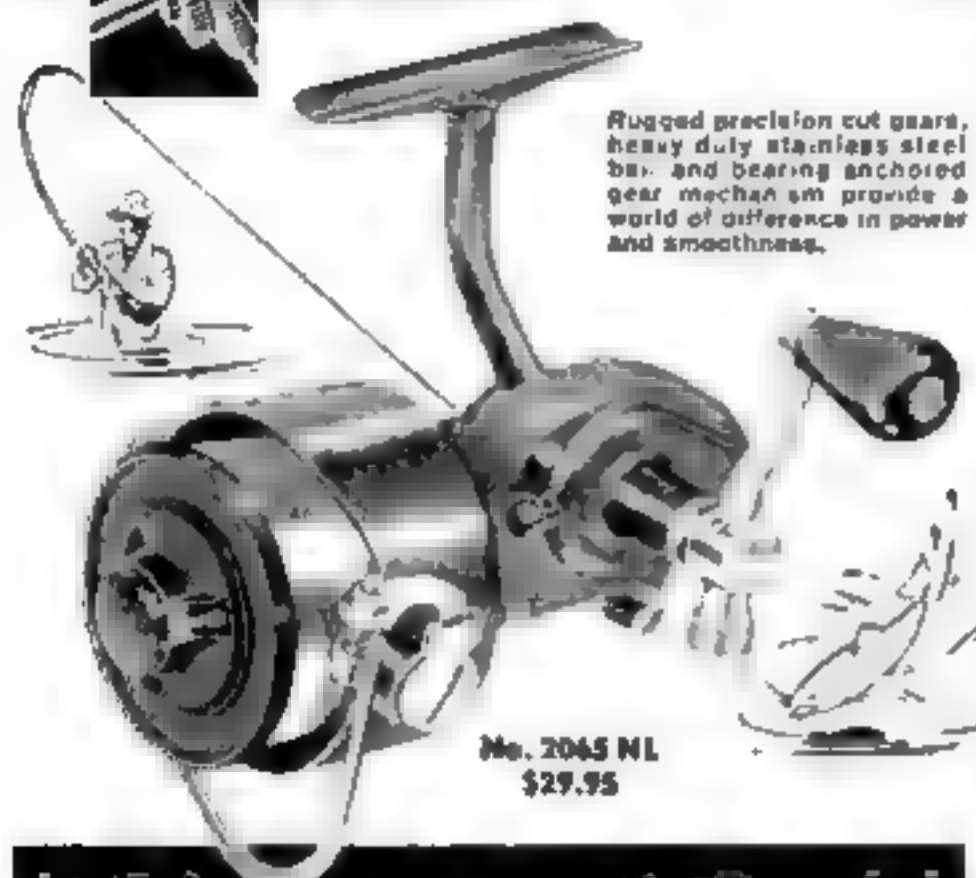
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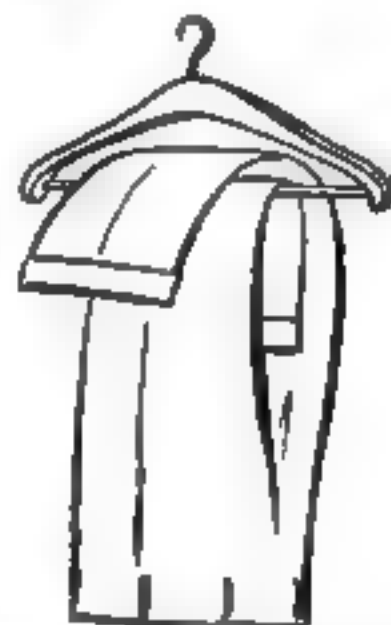
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is launched from a B-52 bomb bay to deceive antiaircraft radar." Aha! The picture shows a B-47 launching the missile.

DAVID PULASKI, Lowell, Mass.

How to Hang Up Pants

WHY struggle with that extra fold to lock trousers on a hanger for travel ["Short Cuts and Tips," Dec., p. 169]? Reverse your first step, folding the leg *inside* across the hanger bar. The pants will hang down farther, but they'll be just as jiggle-proof.



BRUCE MACLEAN, Oakland, Calif.

They Used to Do It That Way

IN YOUR article on making black-and-white transparencies ["Why Not Project All Your Photos?" Dec.] I don't understand why you specify that special, hard-to-get positive film.

I've been making black-and-white transparencies for years with ordinary black-and-white roll film. Expose it against a negative and you get a positive-image transparency—just the reverse of photographing a positive scene and getting a negative.

What gives?

GALEN SHELBY, Chicago.

You're a good photographer, but behind the times. Regular black-and-white film will work, but modern types are so fast you'd go out of your mind trying to control very short exposures. The special positive film is slower, giving you more workable exposures, and also has much wider latitude. You can force the development up to five or even seven minutes, if necessary, to get the high contrast required by slides. Ordinary film would not withstand forced development without the use of special high-contrast developers, which are tricky to handle.

Lesson on Stereo

THAT dual pickup to "imitate stereo" ["New Ideas from Inventors," Jan.] is the silliest idea I've ever heard of. Stereo is a system of sound reproduction in which string and wind instruments are

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NOW...on your trucks... get an extra tire mile for every two you run!

109 million test miles prove the Firestone all-wheel position Transport-100* delivers 50% and more original tread mileage and more all-weather traction than any other regular original equipment Firestone tire. Even when half-worn it gives *faster starts* and *quicker stops* than most truck tires when new. Why? ■ A new tread design.

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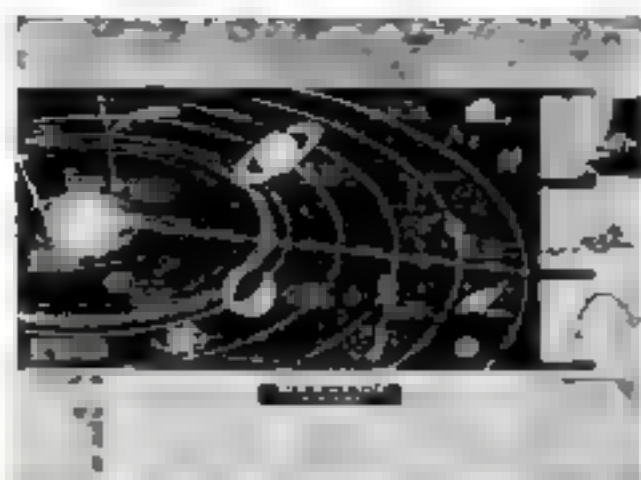
*Firestone T.M.

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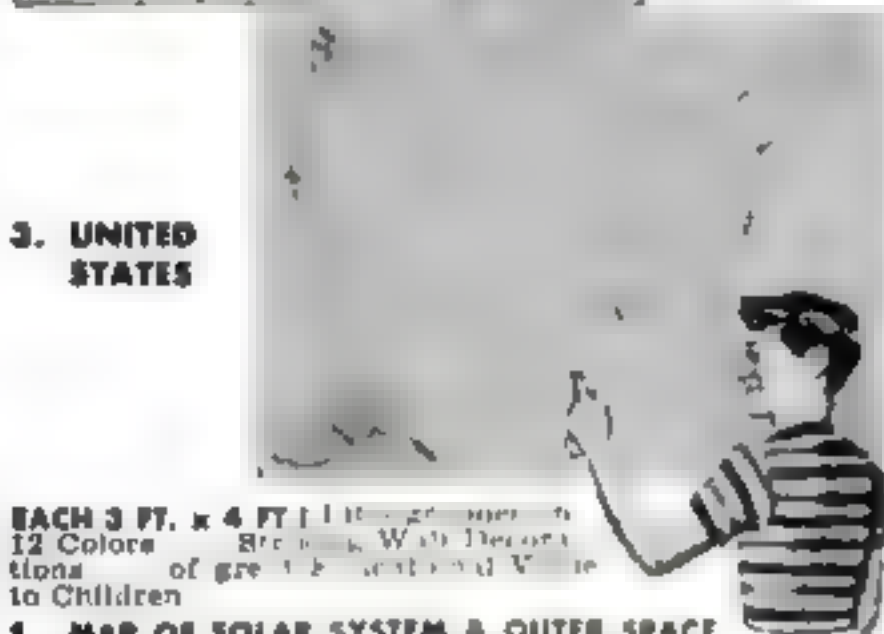
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recorded on separate channels to give more realism.

This inventor merely developed time delay of the same instruments. Record-groove length reduces as the tone arm approaches center. Thus the echo effect would be delayed 1/2,500 of a minute on the outer edge and 1/1,250 when the needle approached center.

And what about tracking? The tone-arm-to-groove angle also changes as the tone arm moves from outer to inner portion of the record. You'd also have trou-



ble with contact pressure on automatic changers. The needles would press down on the record as the stack changed. The higher the stack, the less pressure on the needle farthest away from the tone-arm pivot.

A. M. VIKLA, Rosemount, Minn.

Pros and Cons of Thermostats

THE letter writer from Iraq [Jan.] doesn't understand the full function of a car thermostat if he removes his because of constant hot weather.

The thermostat lets the oil heat up faster so it will boil away any accumulated moisture (from condensation) and keep more from forming. Water vapor in the crankcase forms sulfuric acid, which ruins engine bearings. Even though his air temperature is 100 degrees, without a thermostat he may be injuring his engine. Also, in V-8s with dual water pumps, removing the stat will cause the engine to run hot. With unrestricted flow, the water is pulled through the radiator so fast that it hasn't time to cool. Any engine that overheats with the thermostat in place has an inadequate cooling system.

Incidentally, summer temperatures here on the Mojave Desert are the second highest in the world, close behind those in Iraq.

JACK A. SMITH, Barstow, Calif.

... IF THAT Iraqi had a 1928 Packard like mine, he'd have an adjustable ther-



Six big men and full cargo don't cramp the ride and performance of the new Tempest Safari!

(Only new-size wagon balanced, sprung and powered to move like a big one!)

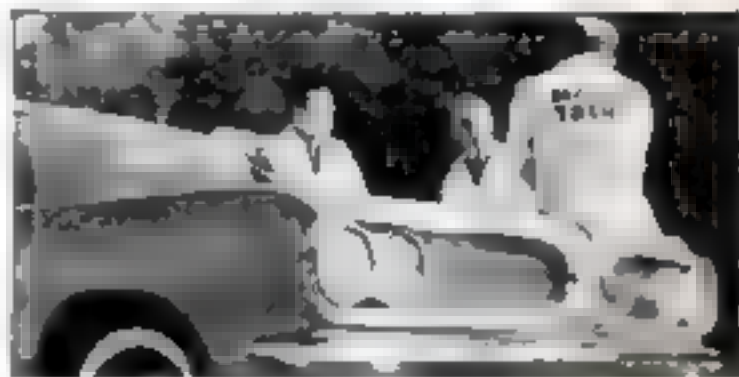
Wide seats (58 $\frac{1}{4}$ " in front, 58 $\frac{1}{4}$ " in rear). 44 inches of legroom in front 37 $\frac{1}{2}$ inches in the back. Even the middle man can stretch his legs. The big front floor hump is gone -the rear tunnel is low. Chalk this benefit up to the rear transmission.

Front engine rear transmission puts equal weight on front and rear wheels. Wagons need that balance. Full load or solo driver, the back end of this one takes a solid grip on the road. Doesn't skip or jounce. Less weight on the front wheels. A cinch to steer.

Fill the Tempest Safari with passengers and gear. The 110 to 155 h.p. gas-saving 4-cylinder engine will scoot the car up steep hills in high gear.

Take a turn in a Tempest. Find out first-hand why Motor Trend editors gave it their Car of the Year Award. Your Pontiac dealer has the Tempest.

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Six Ways To Make Money

A Duraclean Dealership qualifies you to offer six services. Thus on many jobs you multiply profits. 1. **Duraclean:** Unique process for cleaning rugs, carpets, upholstery. No scrubbing, soaking, shrinkage. Aerated foam generated by portable electric machine safely removes dirt, grease, unsightly spots. Dries so fast customers use furnishings in few hours. Process recommended by leading stores, manufacturers, and backed by famous McCall's and Parents' Seals. 2. **Soil Retarding:** Keeps furnishings clean months longer. So now you may be first in town to offer this type service. 3. **Moth-proofing:** Backed by International 6-year warranty. 4. **Flameproofing:** Reduces fire damage. Theaters, hotels, homes offer huge potential. 5. **Spot Removing:** Special chemicals enable you to handle most all spot or staining problems. 6. **Carpet Repairing.**



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mostat. What's more, it's adjustable from the outside, using a small wrench.

F. L. TRUDEAU, Tweed, Ont.

... SOME cars have such powerful water pumps that, at 50 m.p.h., water will be pumped into the top tank of the radiator more rapidly than it can flow down through the tubes. The "piled up" water in the top tank escapes through the overflow pipe and within 15 miles you may have an empty radiator.

If you remove the stat on such a car, replace it with a washer with a hole in the middle corresponding to the opening in an open thermostat, thus giving equivalent restriction.

M. FAHNESTOCK, Pittsburgh.

A Substitute Heat Control

"How an Indoor-Outdoor Heating Control Works" [Jan.] may have made many a reader envious. But if they can't install new controls, moving their present thermostat could result in some of the same advantages.

Buy a few feet of copper bell wire and move the thermostat to the wall in the living area of the home that is most exposed to winter winds. The comfort setting will be lower than it was on an inside wall and a thermometer at the old location will assist in adjusting the thermostat setting for the new location. The new setting for the thermostat will probably be three to five degrees lower than before.

E. C. BLACK, Columbia, S.C.

A Better Way?

I HAVE an answer for Darrell Huff's little quiz ["What Would You Do?" Dec. p. 153]. If I had to cut a board in half and lacked a measure, I'd just cut a



piece of string the length of the board and double the string. This gives the halfway mark with less trouble than balancing the board as he suggests.

BILL SHARPE, Birmingham, Ala.



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Old Wine in New Bottles

I'D LIKE to add a bit to Mr. Flick's letter [Dec.]. The transaxle built into the differential out back is not the only old idea suddenly called new. You won't find many firsts in new cars.

The highly touted fluid drive is a resurrection of the Radcliffe turbine drive brought out around 1924. The silly attempt at air suspension was accomplished more simply with Westinghouse air springs. The modern shock absorber is a version of the old Flentje shock absorber.

RUDOLPH SKRIVANEK, Kearny, N.J.

... IN 1918 I installed first and second gears in a rear-transmission 1913 Studebaker. This old four had priming cocks. With a cold motor, a little gas in each cylinder, and a twist of its tail, it popped off, purring like a contented kitten.

TENNEY C. CALL, Randolph, Vt.

Filtering Pipe Smoke

I HAVE a hint that I'd like to pass along to pipe smokers. I fold a pipe cleaner in thirds (two folds) and insert it in the pipe stem. It would work as well in a



cigarette holder made to take filters.

Pipe smokers will find it provides a clean, cool smoke. One cleaner lasts me about two days as I'm fussy. But the cleaners cost only a dime for a couple of dozen. Cheaper than regular pipe filters.

G. R. PICHETTE, Lake Linden, Mich.

Say It Won't Sink

THE letter about the tiny watch bearings weighing 1/28,349 ounce [Jan.] intrigued me. Mr. Guggenbuhl says they are "so light they float on water." Actually, this is not completely accurate since the specific gravity of the bearing material is greater than one.

What happens is that there is not sufficient force to break the surface tension of the water and therefore the bearings appear to float. If they were immersed in water, with the surface tension destroyed, they'd sink. We see the same principle in action when a glass is overfilled with water and it seems to bulge out at the top.

B. PIDLISECKY, Saskatoon, Sask.



18-year-old Ronald Satterfield of Atlanta, Georgia, asked...

"Where should I build for the future?"

Ronald Satterfield answered this question last year by joining the Air Force. This year about 100,000 young men will also choose this highroad to the future.

Many will become expert technicians in such fields as airplane and missile maintenance, radar, communications. The future will find others in supervisory positions in important support specialties: administration, supply, air police work.

Numerous personal benefits go with service in the Air Force. Steady advancement, the opportunity for more education, medical and dental care, thirty days' vacation yearly. Most important, the Air Force can help a young man prepare himself for the age in which he will have to make his way—the Aerospace Age.

Could this be the place for you to build for the future? Use the coupon below. There's no obligation.

U.S. Air Force

Airman 2C Satterfield whose civilian hobby was building "hot rods," is presently enrolled in a 45-week electronic computer course at Keesler Air Force Base in Mississippi.



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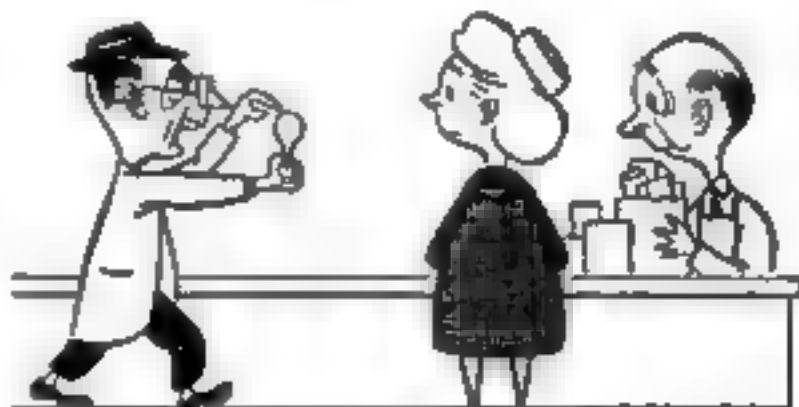
Dept. B-1, 619 Smith St., Toledo, Ohio



Throwing Light on Bulbs

MAYBE some of your readers would like to try an idea of mine:

When I install replacement light bulbs in lamps or receptacles, I mark the date on them with grease pencil. This gives me a rough gauge of the service life of burned-out bulbs and I can check one brand against another.



It seems as though they don't last as long as they used to.

R. A. SCHNEELOCH, Lemon Grove, Calif.

Praise for Detroit

IN VIEW of all the unfair and biased criticism directed at the Detroit automotive industry, may I say a few words praising them? The contributions they have made towards safety and comfort in cars and trucks are too numerous to list completely. Furthermore, the engines, transmissions, and axles are more durable compared to vehicles of the twenties. Don't any of your readers remember how plagued we were with breakdowns? Detroit has made considerable progress in the last 30 years.

JAMES TABATA, Cleveland.

Checking Up on the Corvair

How does a 1960 Corvair driven under normal day-to-day conditions compare with the Corvair you test-drove last year? Here are my eight-month results:

No repair bills. Dimmer switch replaced by dealer first week.

Miles, 10,047; gas, 425.4 gal.; oil added, 2 qt.; miles per gal., 23.6 (50/50 city-country driving).

Gas, \$132.17; oil and filter changes, \$10.22; lubrication, \$3 00. Total, \$145.39; operating cost per mile 1.44 cents.

Top miles per gallon, 27.5 (a long trip); low m.p.g., 18.0 (ice-snow, two weeks).

I have only two complaints. The dimmer switch is too high above the floor level, and the door locks should be the

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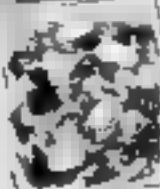
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conventional GM buttons. The handling is in the sports-car class. The ride is very good. The performance is good—not as good as the Valiant's but much better than the Falcon's. As a service engineer covering a radius of 75 miles, I have driven this car under almost every road condition. It has never failed me.

H. J. DANIELL, Rome, Ga.

Overall average m.p.g. of PS's test Corvair was almost the same—23 43.

One More Perpetual Calendar

I've enjoyed working out dates with your 250-year calendar and have clipped it out to save it. For your amusement, here is another method of determining the day of the week of any date:

$$S = Y + D + \frac{Y-1}{4} - \frac{Y-1}{100} + \frac{Y-1}{400}$$

Y is the year in question. D is the number of the day of the year (counting from 1 for January 1, etc.).

Neglect remainders in all divisions. Now when S is found, divide it by 7: The remainder gives the day of the week, with 0 indicating Saturday, 1 Sunday, 2 Monday, and so on.

ABEL STROOCK, NYC.

Half a Kinderwagen

THE kid next door was in the Akron Soap Box Derby. He got the idea of putting an engine on his Derby car, and I got into a project. I got plans and parts from the Gilliom Power Tool Co., as you suggested last summer for the PS Kinderwagen [July], and made a Kart out of the Derby car.



I mounted the whole unit on a piece of 5/8" plywood so when the boy gets too big to crawl through the bulkheads on the car I can remove the unit intact and install it on something else.

CEC VAUGHN, Akron, Ohio.



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11 Troubleshoot & Repair AUTO ELECTRICAL SYSTEMS

Electrical failures are one of the chief causes of car troubles. This is a new AUTOMOBILE ELECTRICAL SYSTEM manual that teaches you to handle all of them! Includes Circuits, Batteries, Lights, Ignition, Accessories, Generators, Regulators, Starting Motors, etc. A down-to-earth professional guide that helps you locate troubles fast and fix them right! Over 200 illustrations, plus \$7.95. Circle No. 11 in coupon.

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There is a host of useful ideas that have brought efficiency in hundreds of leading shops and factories. This is a selection of the best of the best for the car, truck, and other vehicles. It includes a section on the maintenance of engines, etc. Price \$4.00. 230 pages. 100 photos. Circle No. 5 in coupon.

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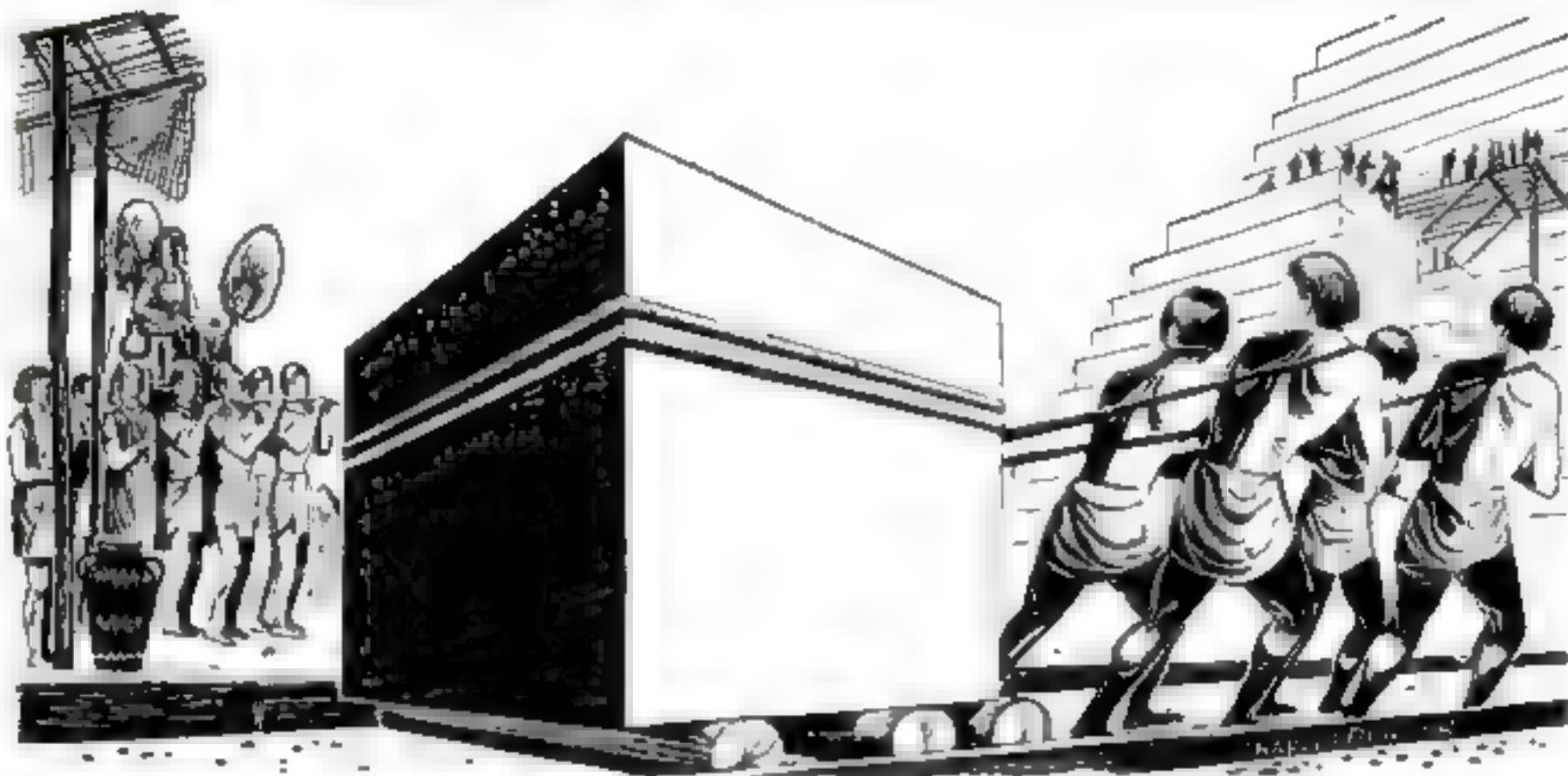
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PS Puzzlers By Joan Steen

April teasers can fool and be cruel . . . Answers on page 229



They Just Kept Rolling Along

IT IS said that the Egyptians used rollers to move the big blocks that went into the pyramids. A tedious job, no doubt. How tedious? Suppose a block is

supported on two rollers, each seven inches in diameter. How far would it advance in one complete revolution of the rollers? (Use $\pi = 22/7$.)



THE first couple of weeks I spent in a probability course pretty nearly threw me. The professor kept talking about "fo-er bahls in an airn." (He was from Harvard.) What he was saying was "four balls in an urn." Strange as it seems, urns and the various colored balls in them play an important role in probability theory. So you see it's not just stilted talk I'm using in this logical problem—but you don't need complex theory to solve it:

There are three urns, each containing two balls. One urn has one black ball, one white; another, two white; and the third, two black. The urns are labeled, but, through a mix-up, all the labels are incorrect. Now how many times must you draw from the urns before you know the exact contents of all three urns?

DIOPHANTUS was a Greek mathematician whose name is now associated with problems that require whole numbers or fractions as answers. Maybe that's why this frustrating legend has

grown up to torture amateur algebraists:

"Diophantus was a child for one-sixth of his life, a youth for one-twelfth, and a bachelor for one-seventh. Five years after his marriage a son was born who



HOW



YOUR



CAR



CAN



SAVE YOU



MONEY

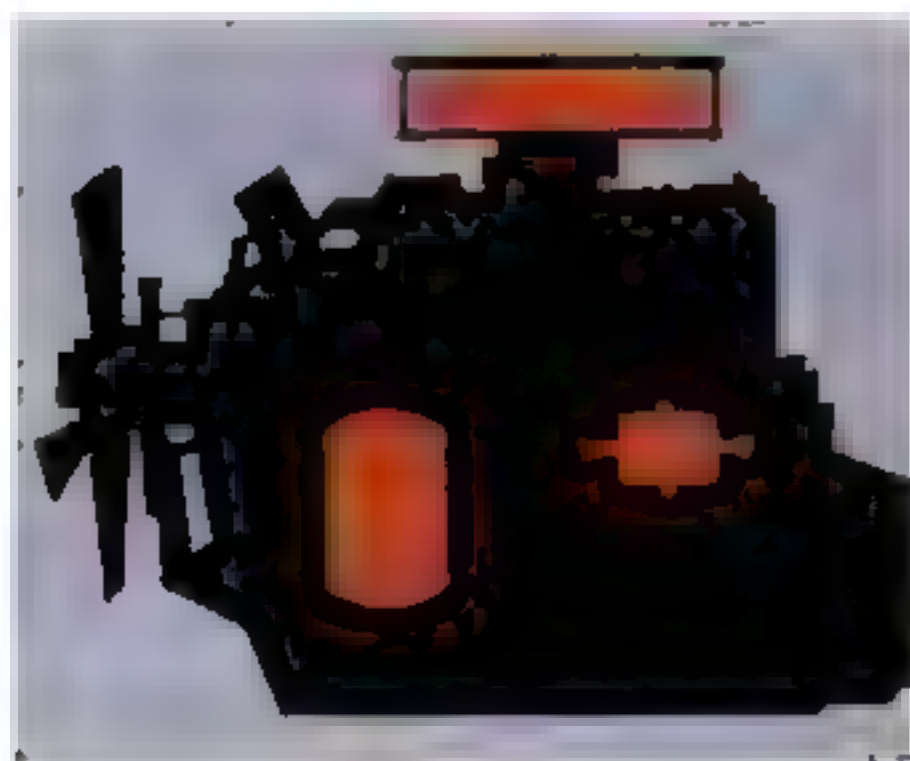


YOUR FIRST LINE OF ENGINE PROTECTION

FRAM
OIL AIR FUEL WATER
FILTERS

YOUR CAR'S WORST ENEMY IS DIRT!

Burning along the highway at 60, do you ever wonder if you should slow down and save your engine? If so, you may have a surprise coming. Your engine couldn't have better treatment than when it's purring at a steady speed on a super-highway.



The Achilles heels in your engine where proper filtration of oil, air and fuel pays off in savings and better engine performance.

It's those short "easy-driving" trips—to the station, supermarket, shopping center and home—that can kill an engine long before its designed life span. Some people call it "stop-and-go" driving. Engineers call it "low-temperature" driving. By any name it's the kind of driving most of us do. National surveys show the average trip for more than half the cars in this country is less than five miles; three quarters of all our errands average less than 10 miles. Hardly far enough to "warm her up."

Yet, it's this kind of driving that builds up the dirt that causes engine suicide fastest. Unless proper precautions are taken to prevent it.

Just exactly what happens?

When you start up your car in the morning, the engine is a lot colder than you are. Fuel and air drawn into the carburetor chill 40° as the mixture expands on its way to the cylinders.

In a warm, purring engine, this frosty air-fuel mix quickly vaporizes. But in a cool engine many of the raw fuel droplets stay liquid. Some trickle down and sizzle to hard carbon deposits on the hot rim seats of the valves. What's left is black gummy soot that coats piston rings and cylinder walls and is washed by oil into the crankcase, where it begins the formation of dirty sludge.

Deposits formed on the too-cool firing terminals of the spark plugs cause them to foul and misfire. The cylinder cools off. Another dose of half-burned fuel, plus acid-forming condensates created in the process of incomplete combustion is washed into the crankcase.

In a steadily humming engine, crankcase oil is hot enough to "cook off" undesirable vapors and huff them out through the crankcase breather pipe. But on short low-speed trips, accumulated acids corrode piston rings and the whole exhaust system.

What else happens?

Added to all this is more dirt: gritty particles sucked in through the carburetor air intake. Bits of rust and metal from gas tank and fuel lines constantly feed the stockpile of "rubbing compounds" that wear away at your engine.

As dirty sludge builds up, it plugs passages. Oil flow slows. Piston rings overheat, wear, shoot oil out the exhaust in blue smoke. There's a loss of power. Bearings overheat and fail. Sludge gums action of hydraulic valve lifters. Rocker arms become oil-starved and clatter loosely from wear. Links of the timing chain grow sludge-clogged and the engine runs "rough" because timing is off. Carbon formation increases and valves stick.

Plugs foul more readily. The engine misses more often. In a vicious circle, sludge forms and causes trouble that forms more sludge.

Can this engine suicide be stopped?

Yes, since dirt, dust and carbon that wind up as sludge in the crankcase can be stopped! The answer is filters. Oddly enough, this solution is easy and economical. So economical that many cost-conscious car manufacturers include as standard equipment even on their new compact cars, Fram's high quality air, gasoline and oil filters. In fact, a new kind of filters developed by Fram and called "Wear-Guard" Filters greatly reduce maintenance costs and prolong engine life.

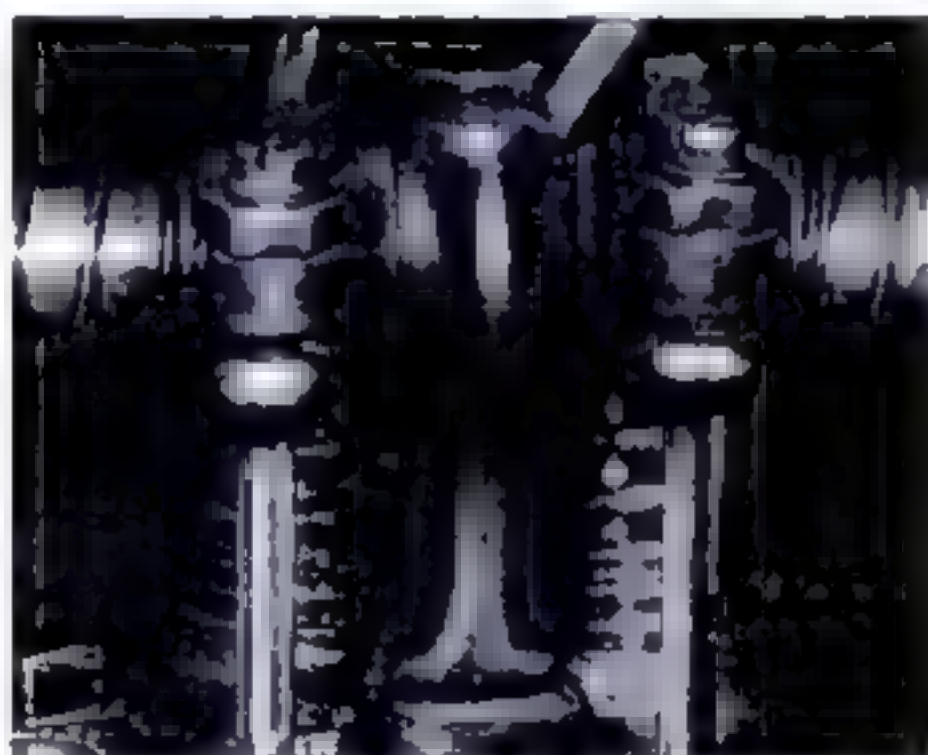
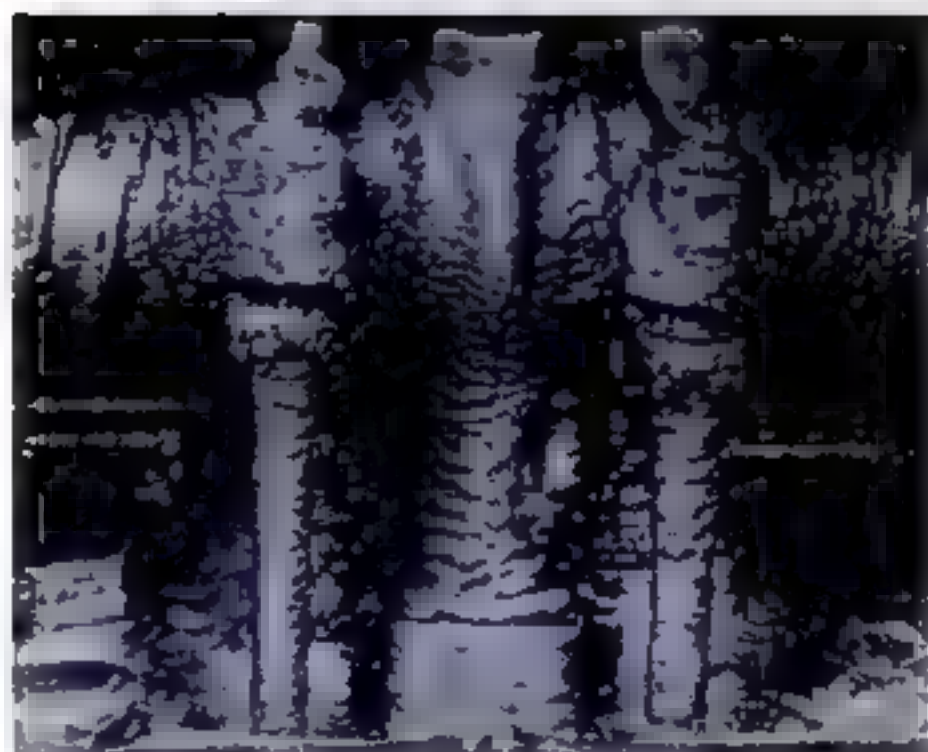
What makes new Fram "Wear-Guard" Filters unique?

Tests have proved that new Fram "Wear-Guard" Filters trap and hold up to 40% more dirt to make them the greatest advance in engine protection since detergent oils. These new Fram "Wear-Guard" Filters guard against engine wear and fuel waste—will keep car engines safer than any other filters tested.

OIL FILTERS ARE YOUR FIRST BULWARK AGAINST ENGINE WEAR

Since sludge contains all the ingredients of engine wear, the first bulwark against it is your oil filter.

There are two basic types of oil filters. A "by-pass" oil filter continually draws off a portion of the car's oil, cleans it and returns it to the crankcase. A "full-flow" filter is installed right in the line, between oil pump and bearings, and accommodates the entire flow of oil to the bearings.



Dirty sludge can ruin your engine. Don't gamble, always insist on a Fram Oil Filter. *Picture courtesy American Petroleum Institute*

The importance of good oil filters was proven emphatically by one of the top 3 car manufacturers in a grueling 15,000 mile test on dusty roads in Arkansas. Driven continually by rotating drivers, some cars had no filters, others were equipped with filters. Oil was changed every 2,000 miles; filter cartridges replaced regularly.

Back in Detroit, the cars were disassembled. Using wear on the unfiltered cars as 100% base, cars equipped with filters showed these results:

Main bearing wear dropped up to 87.9%; connecting rod bearing wear was up to 93.3% less; wear on cylinder bores was reduced up to 84.6%.



For maximum engine protection and top performance, Fram recommends changing to a fresh Fram Oil Filter every 5,000 miles or more often under severe conditions.

Are all filters efficient?

In a series of tests, leading automotive engineers have found a wide difference in filtering ability of different filter brands. Considerably more wear showed when inferior filters were used.

That's why, in the long line of Fram Oil Filters, only the highest quality materials are used to assure peak engine performance and give greatest engine protection. Whether made in tiered discs of specially cut filter paper, pleated paper to supply greater filtering area, or carefully engineered cellulose fiber cores, all Fram cartridges are laboratory tested to make sure they do the maximum filtration job.

Do filters last forever?

Definitely not: even a new Fram "Wear-Guard" Filter—the greatest advance in engine protection since detergent oils—can't last forever or can it make your oil last forever. Besides dirt, there's also the constant addition of those acid-forming elements that build up fast on short-haul, low-speed errands, especially on

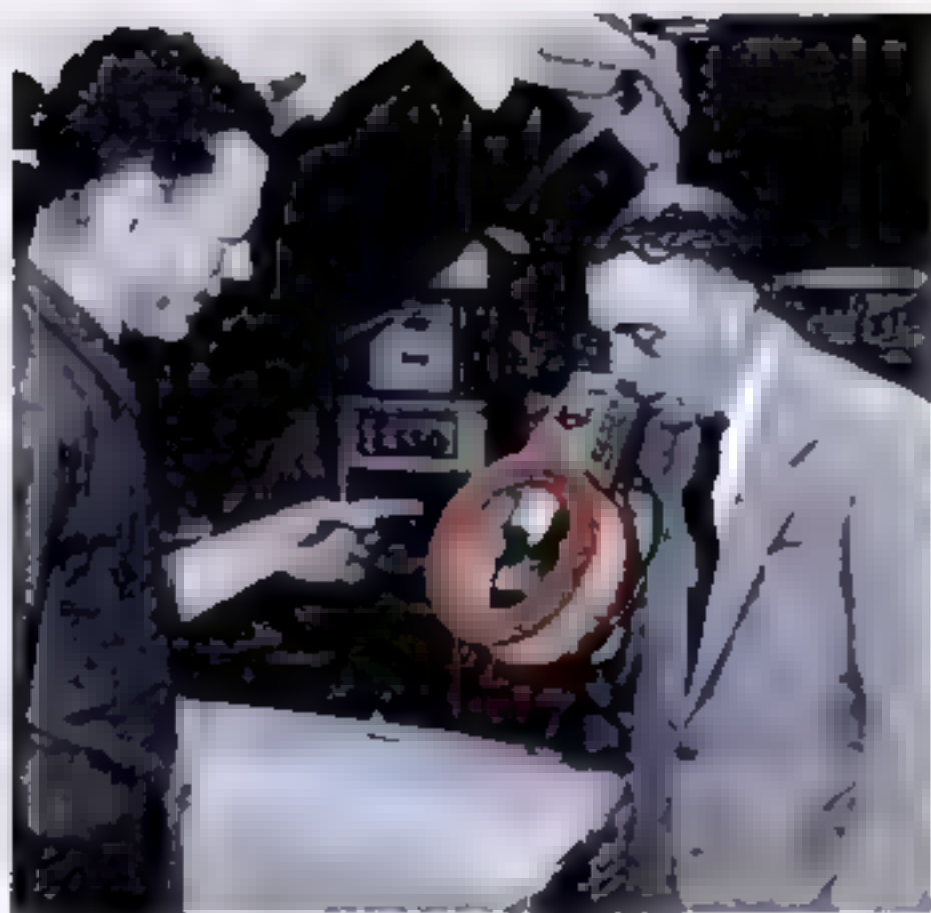
chilly mornings. To beat the corrosion that may result, you must still change your oil and oil filter regularly. Fram recommends changing to a fresh Fram Oil Filter every 5,000 miles or more often under severe driving conditions.

A DIRT CLOGGED AIR FILTER CAN ROB YOU OF UP TO 3¢ A GALLON ON GAS

If you've ever been in the "dust bowl" region, you've seen the skeletons of cars out on the wastes, left there to rust into oblivion. Most of them died from breathing sand and dust.

For each gallon of gasoline an engine consumes, some 9,000 gallons of air are sucked into it from outdoors. Ordinary dust "fall-out" in this country ranges from an average 25-or-so tons per square mile, every month, to a probable high of 616.5 tons in El Paso, Texas. You can realize now what your engine would be swallowing if it took its air straight.

Long ago, engineers discovered that such abrasives could do as good a job wrecking moving engine parts as emery powder. So, for years, cars have come equipped with air filters to trap the dust. Until recently, most air filters involved an oil bath or an oil-soaked metal filter, through which the air was forced before entering the carburetor. These were fairly efficient until the oil became fully contaminated. Then, oil-soaked dirt began blowing through the carburetor, was fed through the cylinders and wound up in the lubrication system—providing new deadly cutting power. Recent tests by Fram Corporation have shown that abrasive particles less than one micron in size can cause significant engine wear.



For maximum engine protection and top performance, Fram recommends changing to a fresh Fram Air Filter every 10,000 miles or more often under extremely dusty conditions.

What's a modern air filter like?

A few years ago, dry-type air filter cartridges, pioneered by the Fram Corporation, began to make their appearance on new cars. Now these neat packages of accordion-pleated fiber, tightly sealed and carefully treated for high filtration and long use, are 99% + effective in removing dust from air breathed by the engine. When the surface becomes clogged, the cartridge still refuses to allow dirty air seepage. But less air gets through, therefore for maximum efficiency, an air filter should be replaced with a fresh Fram Air Filter every 10,000 miles or more often under extremely dusty conditions.

In one recent test a car getting 18.38 miles per gallon with a new dry filter cartridge, was driven only 400 miles under extreme dusty conditions. Mileage dropped to 17.29.

Tests show that on an average, a dirt-clogged air filter can cut gas mileage by as much as 10%. That's why it's good to make sure your air filter cartridge is never clogged. A fresh Fram Filter can

mean savings up to 3¢ a gallon on every tank of gasoline you buy.

Additional advantages of the new dry filter cartridges: unlike the old oil types, they're not messy. They are quickly and easily replaced—and should be, at least every 10,000 miles depending on the type of driving you do.

There's no need though to wait for gas consumption to soar in order to know when the cartridge needs replacement. A Fram "Inspect-O-Scope" will shine through a clean filter, but light is blocked when the filter needs changing. A flashlight or any strong concentrated light will also show up a dirty filter.

GET MORE POWER. EASIER STARTING. FEWER STALLS WITH A GASOLINE FILTER

Did you ever take your watch apart? Undone on the dining room table, it bears some resemblance to the profusion of miniature working parts of a modern carburetor spread on the workbench. Once assembled, a carburetor's microscopic tolerances, delicate valves and nearly invisible orifices demand clean-as-a-whistle housekeeping. Even the tiniest speck of dirt in just the right place can cause an engine to go dead. At best, it can clog tiny orifices, prevent miniature spring-loaded valves from seating properly and jam other delicate mechanisms. All this can result in power loss, poor fuel-air mixture with resultant sludge production, higher gas consumption, hard starting, and stalling in traffic.

Actually, your car's dry air filter cartridge keeps much of the damaging dirt from getting into the engine. But it isn't just air that enters the carburetor. Fuel is fed through it, too. And the assorted

particles of foreign matter that gasoline can pick up enroute from gas tank through fuel lines to mixing chambers is nothing short of amazing. Shiny bits of metal flake from pipe linings. Rust forms from condensation in the gas tank. Dirt somehow manages to penetrate all barriers.



It's easy to have a Fram In-Line Gas Filter installed. All your serviceman needs is a tube cutter and a pair of pliers.

How can dirt be stopped to save you money?

Most cars have a small glass settling trap installed on the fuel line just ahead of the carburetor to trap such debris. Some of these also have cleanable or replaceable filter elements that do an excellent job of holding back incredibly small particles. If they become clogged with dirt, however, fuel flow is impaired and the engine is starved. A check every 5,000 miles is all that's needed to keep it going properly.

Newest wrinkle in fuel filters is Fram's In-Line Filter. No bigger than an egg, it is made of pleated fiber housed in a rust-resistant nylon case and can be installed any place where six inches of fuel pipe is exposed. A tube cutter and a pair of pliers will see it positioned. Some major car manufacturers install them as original equipment on their '61 cars. For best service, replace it every 5,000 miles or more often under severe conditions.

TIPS ON DRIVING AND CAR CARE THAT CAN SAVE YOU MONEY

- **Don't start your car and let it idle to "warm up" the heater or the engine** on cold, damp mornings. With no work to do, the engine is running cold, building sludge and acid-forming waste at a staggering rate. Start up and take off normally. The heater will warm up faster when the car is moving anyway.
- If you do a lot of stop-and-go driving, have your spark plugs cleaned and spaced at least every 5,000 miles. If most of your driving is short-haul at low speeds, ask your serviceman for hot-range plugs that heat up quickly.
- During cold weather ask your serviceman to put in a high temperature thermostat (180 degrees). Reinstall the normal one in the Spring.
- Change oil regularly. If all your driving, or most of it, is short-haul, motor oil should be changed more frequently.
- Use rust inhibitor in your car's cooling system. If scale forms and water overheats, this may throw your thermostat out of kilter and the engine will run cold.
- If your car has a replaceable type air filter cartridge have it checked for damage and leaks. Be sure only clean filtered air reaches your carburetor. If you have an earlier model car with an oil bath air filter, your dealer can replace it with a modern Fram dry type air filtering unit.
- Have all filters checked regularly to see that they're clean and working.

ENLIST YOUR SERVICEMAN'S HELP HE KNOWS BEST!

To help assure your car of the life built into it by the manufacturer, your serviceman is your best advisor. His most uncomplaining customer is the one who comes in regularly for 1,000-mile check-ups. Here's the advice of one good suburban service station owner:

"The man who brings his car in every 1,000 miles gets everything. We put it on the rack and grease all the ball joint nipples before they can get plugged with mud. While it's there, we see the condition of the brake lines, we shake the idler arms to see if there's play, we check the suspension. We notice any erosion in the exhaust system that may hint at acid in the crankcase. Leaks show up.

"Checking all the filters is automatic—like the battery fluid. And while we poke around these things, we often notice trouble before it starts—loose wires, worn hoses and the like.

"One thing car owners should always do is to come in *immediately* when anything erratic shows up. Usually they keep



Proper maintenance can prevent most annoying breakdowns. An ounce of prevention is worth a \$100 cure!

driving until the car breaks down a week later in the next township, and we have to haul them home.

"For instance, if you hear a continuous noise that wasn't there before, don't wait! Bring the car in NOW. That red light on the dashboard means the generator quit. It will cost you a new battery if you wait. That oil pressure warning light that won't go away means you're burning up the engine.

"If you notice something odd—like a temperature needle wavering around where it never wavered before, come in and ask why it's doing that. You might just save a big repair bill and several carless days.

"If you notice any resistance in the steering, if the wheel catches on the return—don't wait. Cars are tricky enough when they go where you steer them.

"The silly part of all this is that most of the things that are "too unimportant" to bring a car in for, are usually just the things that can be fixed in a jiffy for a dollar or two today. But, if ignored, they'll run into hundreds of dollars a few weeks from now."

FRAM FILTERS ARE YOUR FIRST LINE OF ENGINE PROTECTION

Apply the suggestions given on the foregoing pages and *your car can save you money!* The importance of filters cannot be over-emphasized. That's why it's wise to always insist on Fram. The list of Fram "firsts" in filter research and development would fill a book. No wonder more car manufacturers install filters from Fram on their new 1961 cars than any other filters.

Fortunately, you'll find Fram Filters are sold by more dealers than any other filter brand. Insist on Fram Filters—your first line of engine protection.



HOW



YOUR



CAR



CAN



SAVE YOU



MONEY



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YOUR FIRST LINE OF ENGINE PROTECTION

FRAM
OIL AIR FUEL WATER
FILTERS

PS Puzzlers

continued

lived one-half as long as his father and who died four years before his father." How old does that make Diophantus? Try a reasonable guess.



A MAN has two eggs for breakfast every morning. He doesn't buy them, beg them, steal them, or find them. He doesn't keep hens and nobody gives him the eggs as gifts. How does he get them?

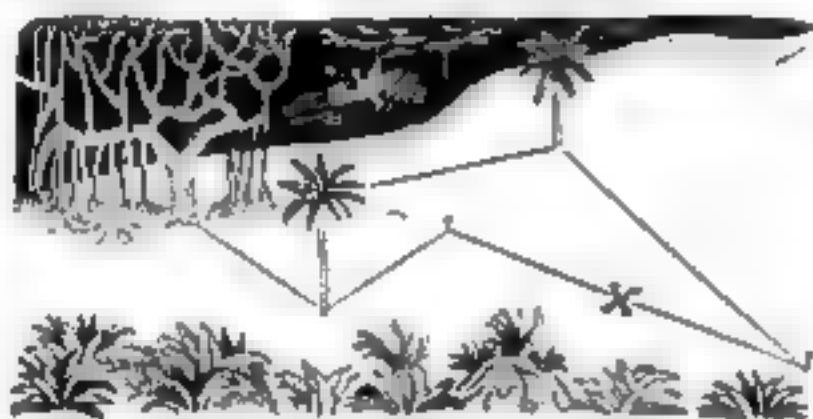
THE city health agency made a spot check of sickness at the end of the winter. Sampling 100 people, they found that 85 percent had had colds, 79 percent had struggled with flu, and 63 percent had come down with Virus X. Can you figure out the least number of unfortunate souls who must have been stricken with all three ailments?

A KARTING club was holding a meet on a small oval track. During one race a proud father remarked, "That's my boy Johnny in the blue helmet."

"I see," said a fan next to him, "and how many karts are in the race?"

"One-third of the karts in front of Johnny plus three-fourths of the ones behind will give you the answer."

Puzzle of the month



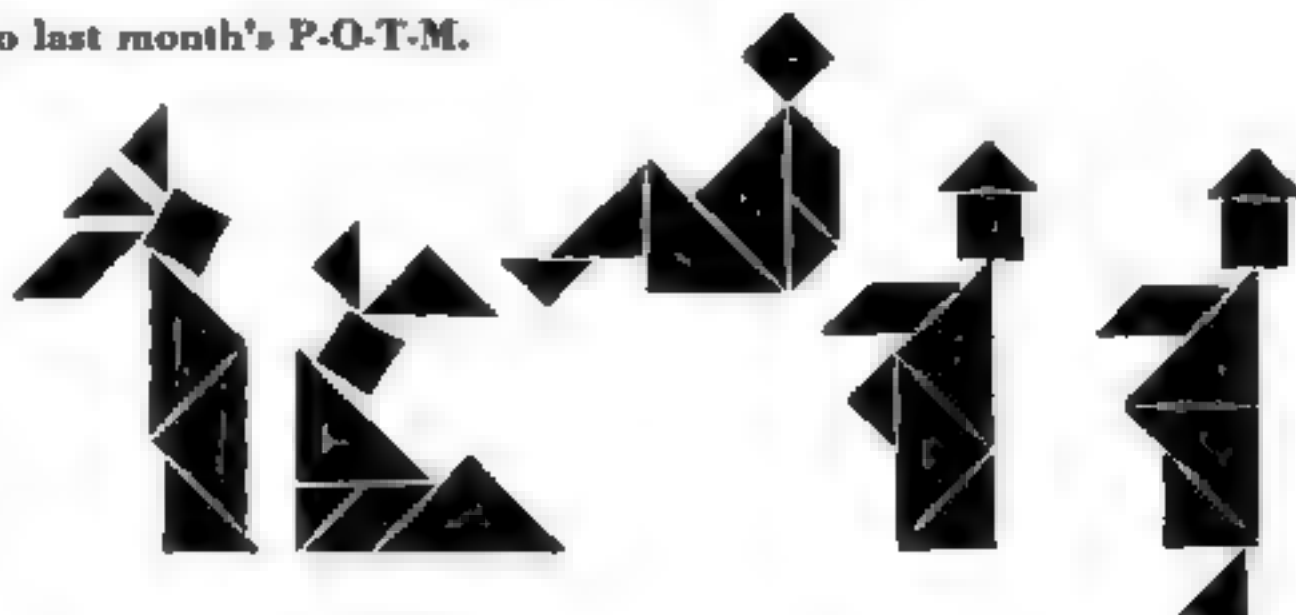
TO MY mind, nothing equals the joy of seeing the solution to a puzzle all at once. Without lifting pencil to paper the full-blown inspiration bursts upon you like magic. With such a broad hint to guide you, you probably won't have any trouble with this puzzle—but you must back up your hunch with rigorous proof.

It's buried treasure you're after. The

scene: an island with two palm trees inland and a banyan tree on the beach. The pirates stretched rope from the banyan to one of the palms, then laid out an equal length at right angles to the first, marking its end with a stake. They did the same with rope from the banyan to the other palm. Then they stretched a line between the stakes, found the center, and buried the loot there. They sailed away taking rope and stakes with them.

Years passed. Then one day they came back to the island—and discovered to their horror that the banyan had blown away in a hurricane. Confused, they searched for the hiding spot—in vain. But surely you could have told them where the treasure lay? (Answer next month.)

Answer to last month's P.O.T.M.



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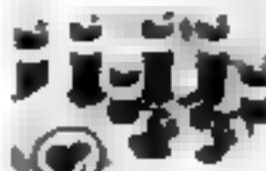


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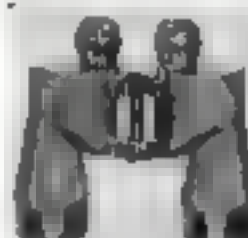
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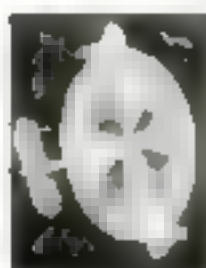


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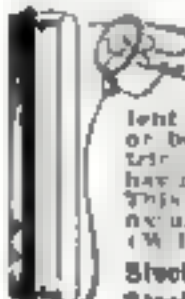
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The month in science

Git along, little hippo. The romantic days of the open range may come back—in Africa, and with a native twist. Great herds of elephants, hippopotamuses, and eland, rounded up by dark-skinned wranglers (hippoboy?), could supply desperately needed meat for the fast-growing, hungry continent.



This is the idea advanced by several American experts. They build a strong case:

Much of Africa is no good for farming—too little rain in some areas, mineral-deficient soil in others. Only recently a grandiose attempt to grow earthnuts (English for peanuts) in Tanganyika went completely bust. ("A megalomaniac pipe dream advanced in ignorance of the plainest facts about African soils," is what Fraser Darling of the Conservation Foundation called it.)

Standard livestock—cattle, sheep, goats—are no better adapted to undeveloped Africa. Diseases and insects (like the tsetse fly) kill off high-grade animals. Those that can survive might upset a precarious balance of nature. Goats, for instance, get the blame for making a desert out of North Africa.

That leaves game. There are about 30 species of native hoofed animals that, handled properly, could make a reliable and abundant food supply. Among the best bets are elephants, hippos, and antelope (20 different varieties). They live in herds so they could be driven and corraled easily, like the Laplanders' reindeer. Some might be domesticated (elephants already are, but as prime movers, not as meat producers).

Hippos may be the most promising livestock animals. They grow fast, efficiently converting green plants into high-quality protein. And they are big producers—one hippo is equivalent to 60 sheep. "Hippopotamus steak," says Michigan State's George

The month in science continued

Petrides (who has tried it), "is particularly delicious and not at all fatty."

How to behave with Space Creatures. Many scientists are now convinced that intelligent life inhabits some of the unknown planets surrounding distant stars. We've been trying to get in touch with these Other Beings (whatever they are) by radio [PS, April '60]. No luck so far. But what will happen when we do bump into them?

Our whole civilization could collapse, says a Government-sponsored report, if the Other Beings turn out to be more advanced or more energetic. Look what happened to the Aztecs when the Spaniards arrived. But it's just as likely that superhuman beings would see no point in bothering with standard-type humans, and would leave us alone.

A real moral problem arises if the Other Beings turn out completely unhuman in appearance (that's almost certain) but roughly human in intelligence (that's quite likely). Should we treat them like very smart horses? How could we tell?

Face-to-face meetings in space are unlikely for at least 20 years (if we have to do the traveling). But we might find their beer cans and candy wrappers sooner, while exploring Venus or the moon. Radio contact could be made tomorrow.

Goodbye MAIN, hello 6-2. After 82 years, the telephone company is giving up on exchange names and going to numbers, just numbers. MAIN 5-3000 becomes 625-3000. In Omaha, Atlanta, parts of Chicago, and many other cities, 2,250,000 phones have already switched over to ANC (All-Number Calling), and the rest of the system will gradually follow suit.

The telephone machinery has been working with numbers-only all along, of course. Whether you dial M, N, O, or 6, all the exchange knows is that it feels six electrical pulses.

Now the phone experts insist that the all-number scheme is better for people as well as for machinery. Tests showed that seven digits are just as easy to remember as a name and five digits—for short periods, that is, not long ones. But more important, ANC cuts down the wrong-number calls, which exasperate the customers and cost the telephone company money (by fruitlessly tying up circuits). Half the dialing errors result from confusing one with I, zero with O. You can't make either mistake if there are no letters. (Letters can't be eliminated from dials right away—you still need them to call phones that have not yet switched over to ANC.)

The change was inevitable, anyway, because AT&T was slowly but surely running out of exchange names. Using names, no more than 540 different exchange codes can be made up. (Even a beatnik poet would be stuck for a name to fit dial pulls 5-7—L, K, or J followed by P, R, or S.) Numbers can be arranged into 800 different office-code combinations, which should be enough for a while. After that you'll have to remember longer strings of digits.

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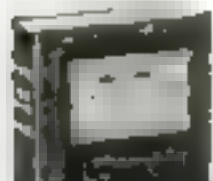
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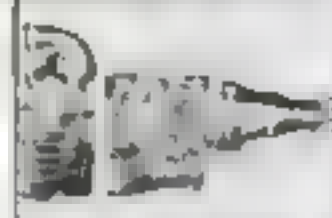
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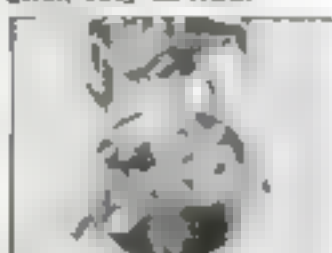
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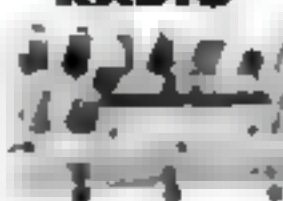
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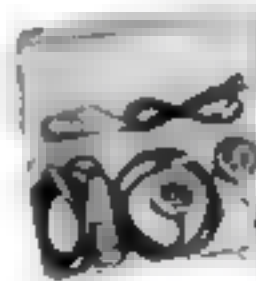
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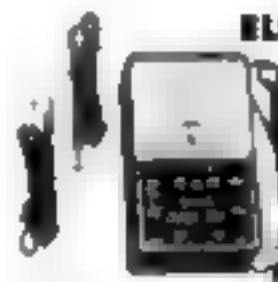
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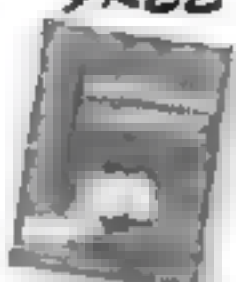
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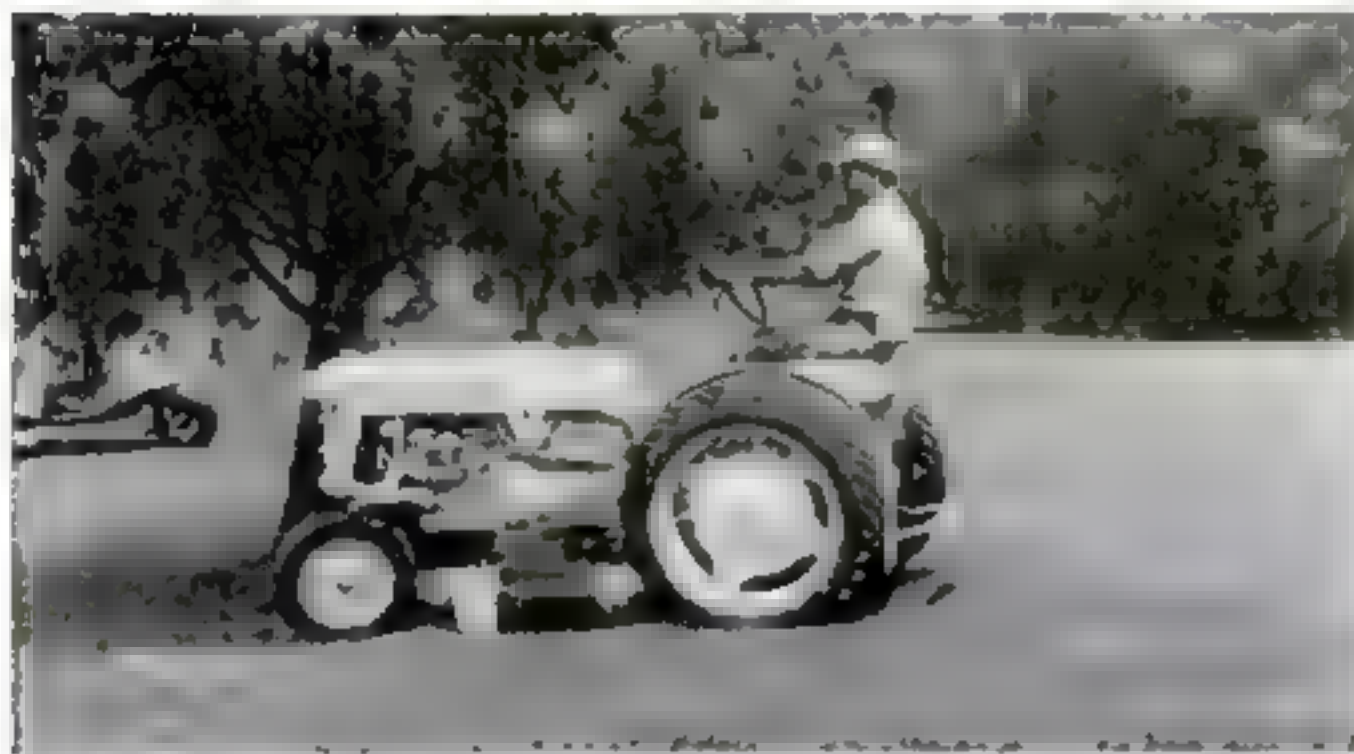
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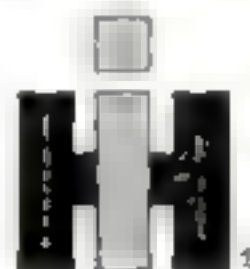
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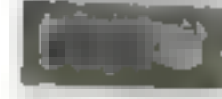
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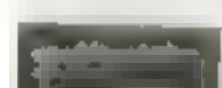
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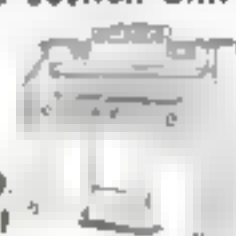
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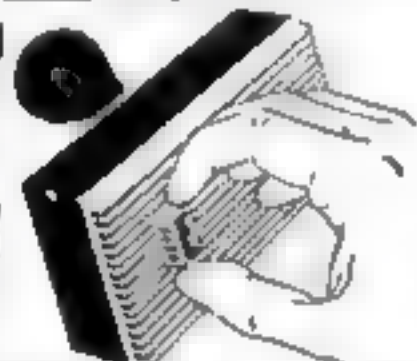
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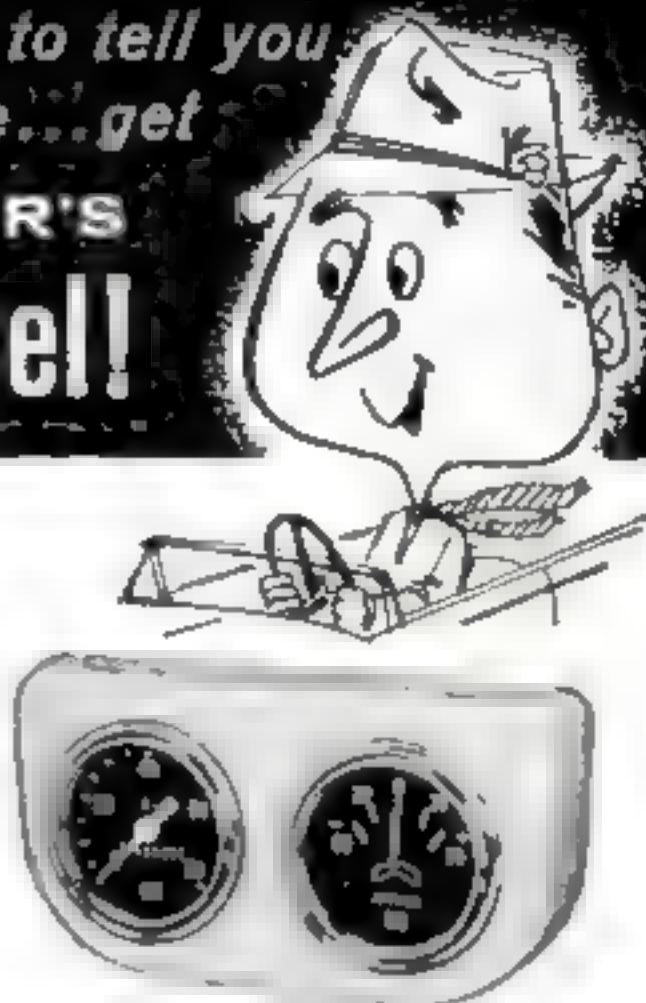
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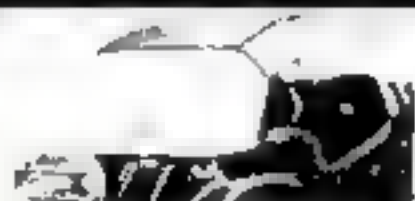
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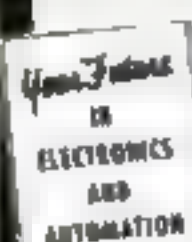
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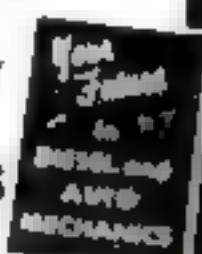
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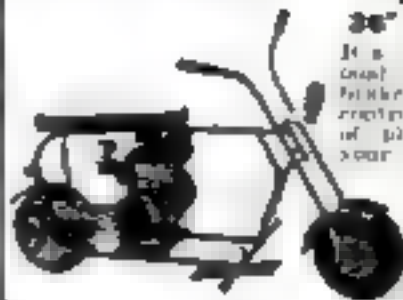
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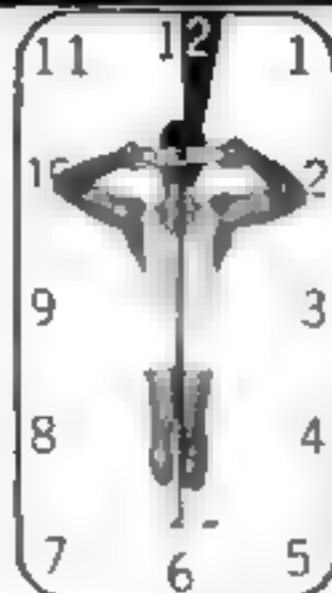
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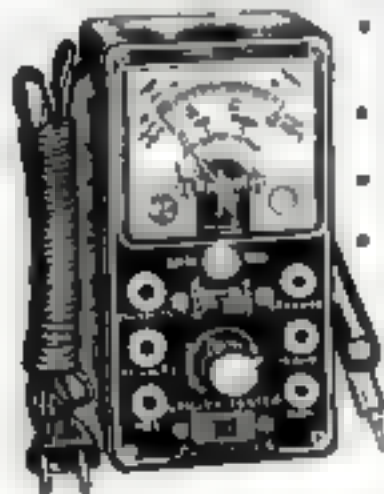
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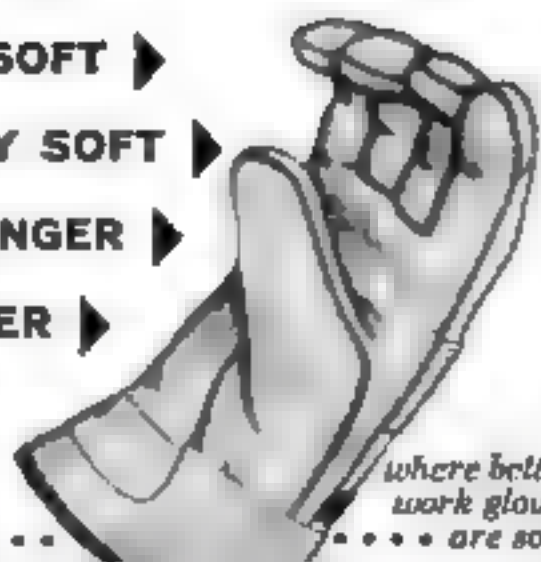
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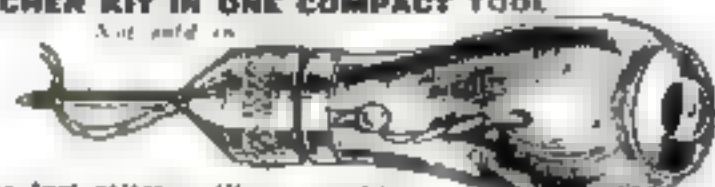
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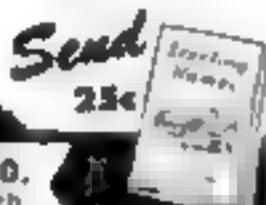
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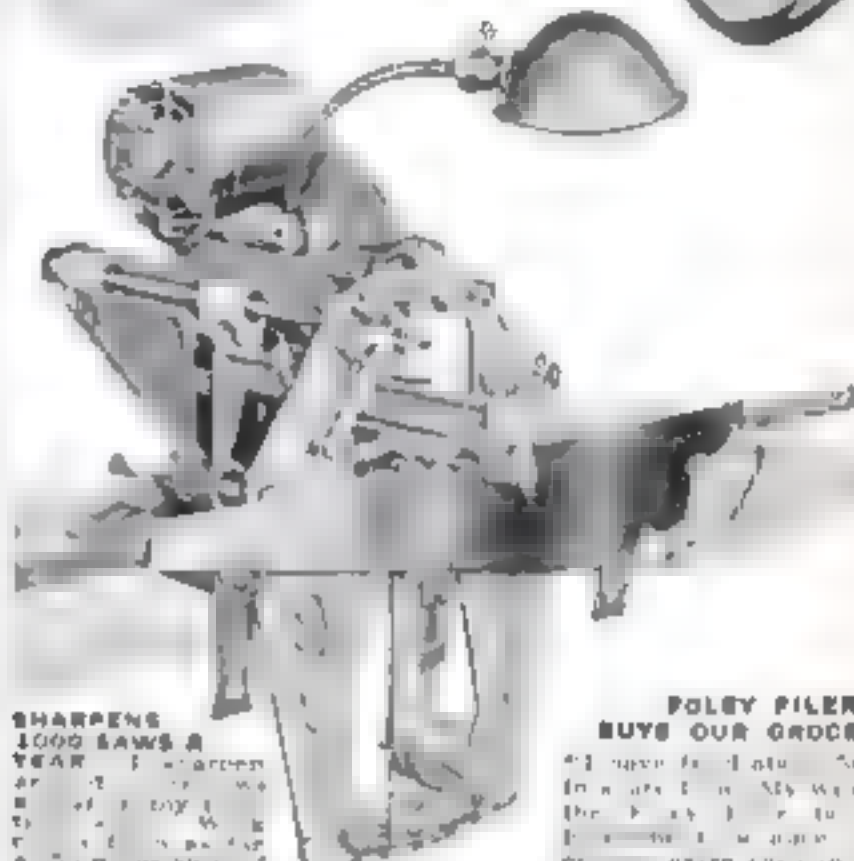
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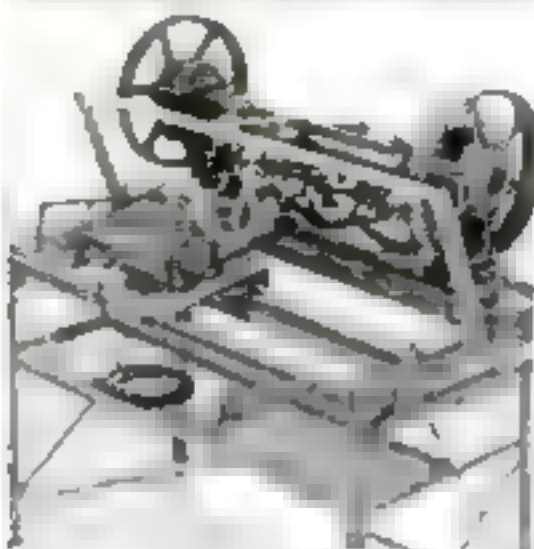
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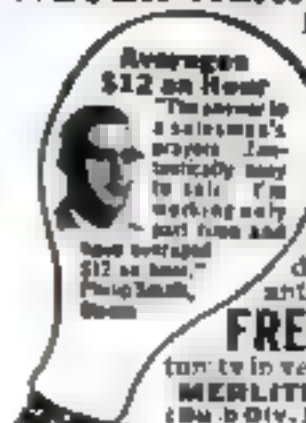
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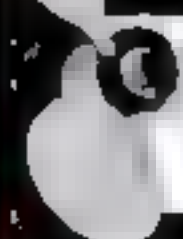


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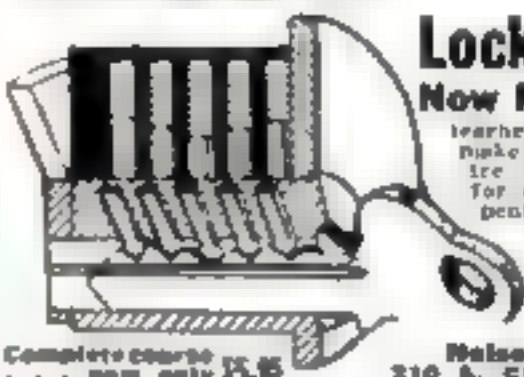
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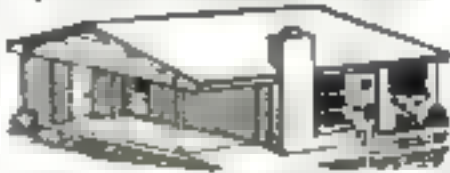
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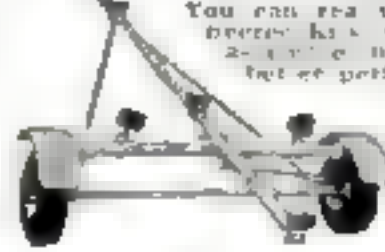


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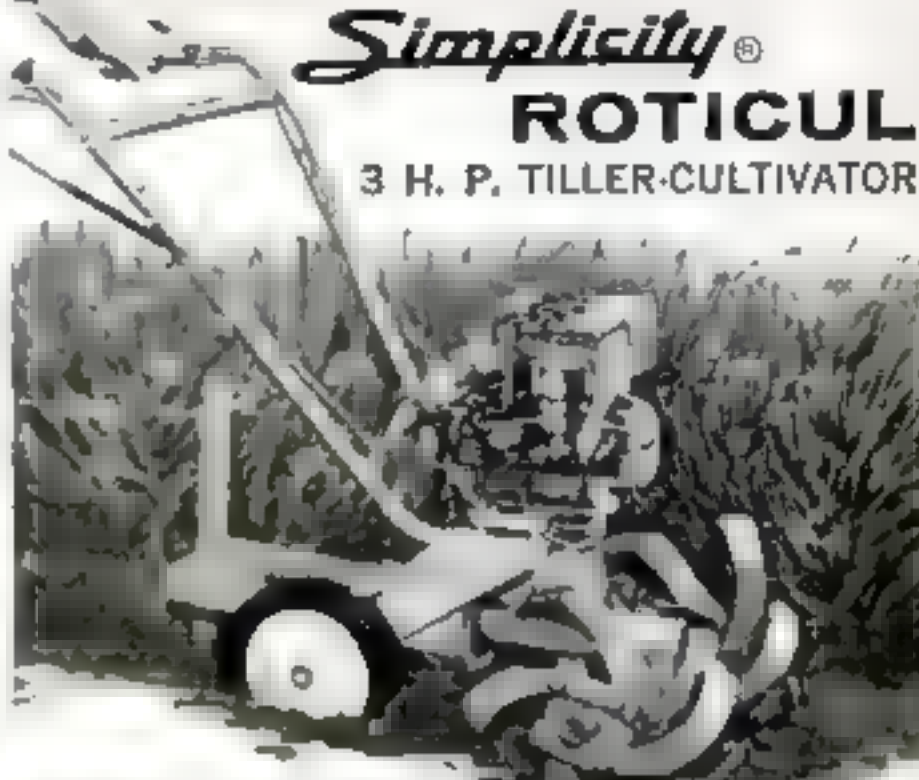
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It takes a quality tiller to do precision tilling. Rotacul tills within a fraction of an inch of fences, hedges, etc., with full operator visibility, quick responding finger-tip controls, full power reverse to end exhausting pull-back. Scientific tilling action, non winding, self-sharpening tines & guaranteed against breakage. Write for free catalog.

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MANUFACTURE THIS BEAUTIFUL CONCRETE OUTDOOR FIREPLACE

Right in Your Own Backyard

\$4.00 Worth of Sand & Cement produces this Attractive Fireplace.

Sells on Sight from \$60. to \$80. Easy to start your own Profitable Business.

The General Fireplace Molds and Process are the most amazing and foolproof ever invented. Simple to operate. Two men can produce five fireplaces a day.

BIG DEMAND!!

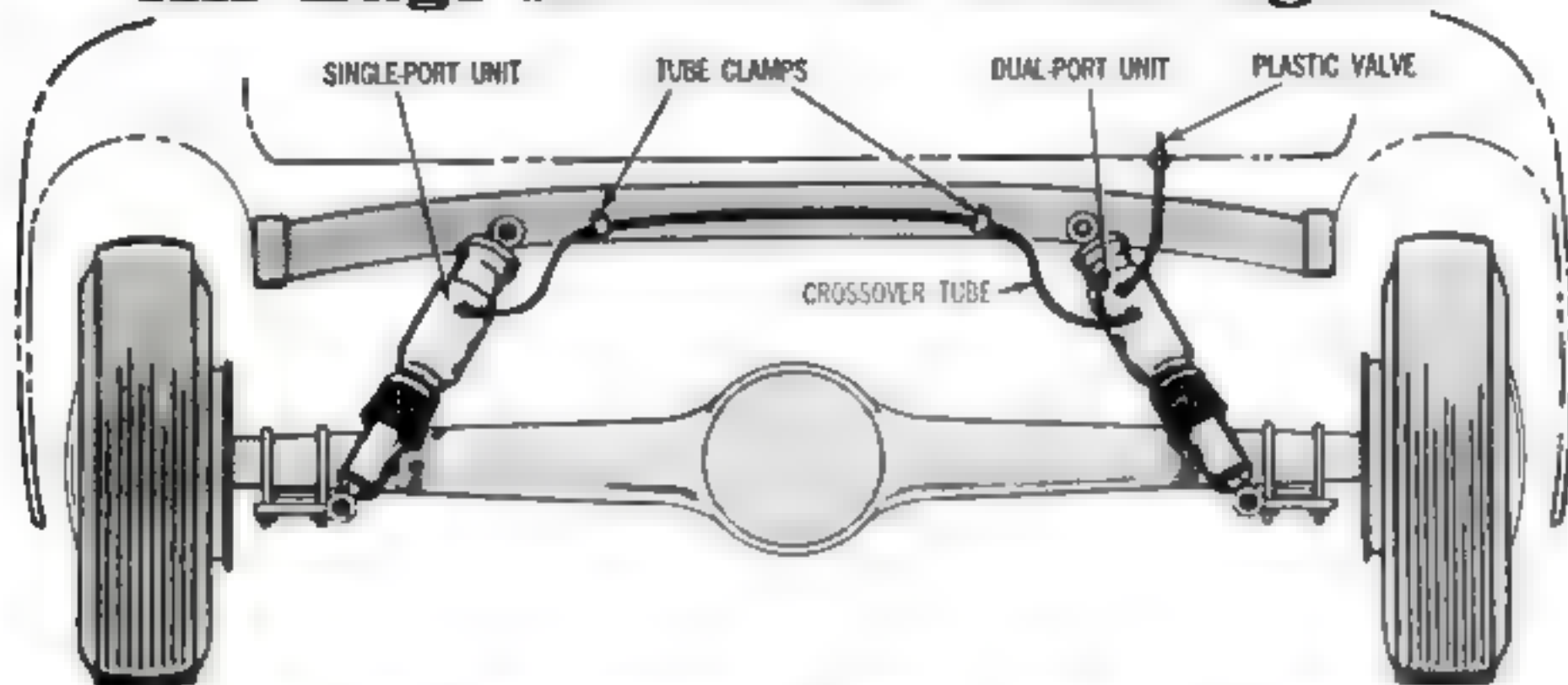
Sell all you produce to Department Stores, Homeowners, Parks, Nurseries and Picnic Groves. Fireplaces sell on sight. No experience necessary. We supply full operating instructions and equipment plus the know-how that spells BIG PROFITS. This is an outstanding opportunity for men of vision and small capital to get into a busy rich paying field. Don't delay, be the only exclusive manufacturer in your own home town. Mail coupon at once for full details as to how you can reserve your territory. Molds sold only on exclusive franchise.

GENERAL ENGINES CO., Inc., Dept. SF-41
ROUTE 130, THOROFARE, NEW JERSEY

Mr. Tor of Philadelphia writes: Sold 250 in first 4 months. Selling to Sears Roebuck, John Wanamaker, and Gimbel Bros. in Philadelphia area.

Name _____
Address _____
City _____ Zone _____
State _____

Air Bags Are in the News Again



DELCO is the latest firm to introduce load-leveling shock absorbers to replace the standard rear shocks on passenger cars and station wagons. Delco's new superlift shocks combine a neoprene air-spring arrangement with a regular hydraulic shock absorber in one interworking package. The combination serves as an overload spring, permits constant height control, and does the normal job of absorbing road shocks.

To level an overloaded vehicle, you merely pump up the new shocks through valves in them. (An extra few dollars buys a plumbing kit that lets you add air

through a fitting in the trunk—see diagram.) When the load is removed, you bleed off the excess air.

Should the neoprene air bag rupture—an unlikely event, it's claimed—the shocks "fail safe," providing normal hydraulic shock-absorbing action, but of course without the extra weight-bearing ability of the air spring.

Delco has its sales eye fixed on the station-wagon and compact-car markets. Wagons must often carry heavy loads with inadequate springing, and the light compacts can use an assist, too, when overloaded.

Buick's sporty Special. Buick will introduce a jazzed-up two-door version of its compact Special this month. The car, to be called the Skylark, will have individual bucket seats and the hotter 185-hp. aluminum V-8 Buick recently made optional equipment for Specials. (The engine gets its extra 30 horses, compared with the standard V-8's 155 hp., from a four-barrel carburetor—which replaces the normal two-throat carb—plus a boost in compression ratio from 8.5:1

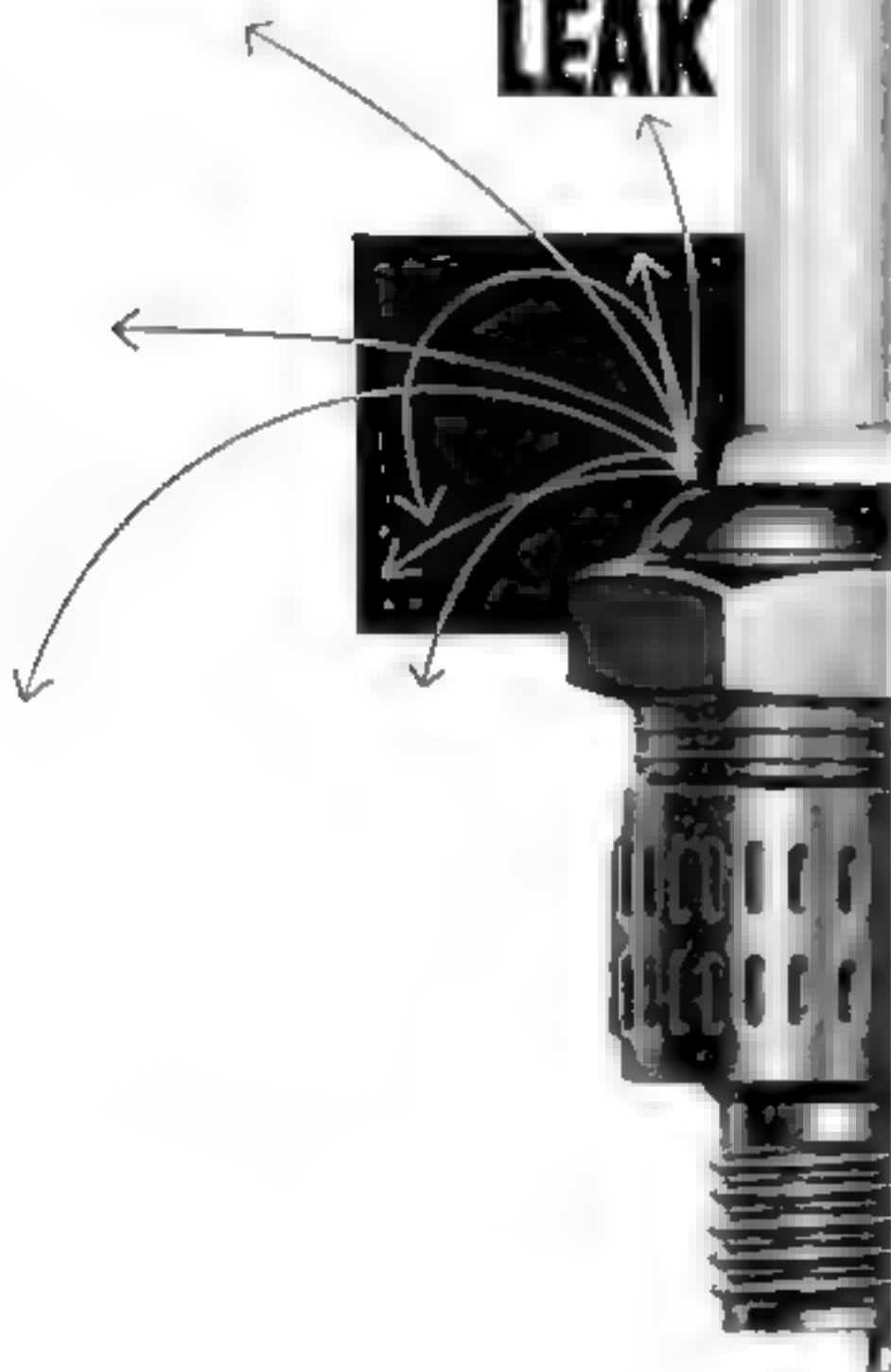
to 10.25:1.) In addition to body style and hotter engine, the Skylark will feature distinctive trim and small styling touches to set it apart from other Special models.

Olds also plans to offer a sporty, two-door model in its F-85 line; it's due about May 1. Like the Skylark, it will have bucket seats and the 185-hp. V-8. Pontiac should also follow suit, since its Tempest shares the same basic body shell as the Special and F-85.

Now: replacement alternators. Autolite will probably be the first supplier to get AC alternator-generators

on the replacement-parts market, although several other manufacturers are also rushing to get them into production.

**SOME
SPARK PLUGS
LEAK**



SOME DON'T!



Problem: Some automotive spark plugs leak. Even when new. They leak because the insulator is not perfectly sealed to the outer steel shell. And this leakage, as you might expect, does nothing to improve either your gas mileage or your pick-up and performance.

How can you avoid buying spark plugs that could leak?

Simple. Just look at them before you buy. Appearance tells you a lot about how the plugs were sealed. Take the shiny plugs you may have seen on your dealer's shelves. Most of these shiny plugs are sealed with powdered talc. They're not guaranteed against leakage.

They are not acceptable for severe military service. What other kind of spark plug is there? The blue kind. The kind Autolite makes. In these plugs, the shell is sealed to the insulator under tremendous heat and pressure. Autolite guarantees every plug against leakage. We also sell many thousands of them to the military.

Suggestion: There are two ways to make sure your next set of spark plugs does not leak. Take a good look at them before you buy, or, easier still, simply insist on Autolite. We make a set to fit almost anything with wheels. Remember, the color is blue, the name is Autolite.



AUTOLITE

SPARK PLUG DIVISION • TOLEDO 3, OHIO

DETROIT REPORT continued

The Autolite replacement alternators could be out by the time you read this report. They are designed to replace both the AC alternators currently fitted to Chrysler cars as standard equipment and the DC generators used on all other makes. Exact prices aren't firm yet, but

they will be higher than those of DC generators—for the present, at least. If, as expected, the auto industry makes a wholesale switch to alternators during the next two years, the price should fall to almost the same level as for equivalent DC generators.

Biggest V-6 ever. GMC Truck and Coach engineers are nearing final stages of testing on an outsize V-6 engine designed to bridge the displacement gap between the largest current V-6 gas-burning piston engine (401 cu. in.) and the whopping 702-cu.-in. V-12 or Twin Six. The new V-6 will displace nearly 500

cubic inches and promises to be the most powerful V-6 ever built.

And there's a bonus: Interchangeability of parts, a key feature of current V-6s and the V-12, will be carried over into the new engine; many parts out of present engines will fit it and its block will be machined on the same tooling lines.

Gray hair for importers. The rumors that domestic auto manufacturers are preparing under-100-inch-wheelbase cars for sale in this country are not making foreign car makers happy. Already hurt by U. S. compact cars, a number of overseas auto companies fear that still smaller Detroit automobiles will cut their sales even more—and perhaps destroy their profitable U. S. market. The pinch could be even more severe if the cars were exported to the European and world market. Renault's president recently appealed to Detroit not to drop "the atomic bomb of the small car on the European market"—further indication that Detroit

may be planning to build and sell compact-compacts in the near future.

Many experts are now backtracking on the old argument that "U. S. auto makers can't build small cars at prices competitive with the Europeans."

Rising standards of living abroad are gradually boosting labor costs; many materials cost more overseas than here. Experience in the U. S. with automation and the volume-production concept, coupled with careful cost engineering, would reduce the gap further. And many planners now foresee a steady rise in the number of buyers who will be interested in maximum-economy transportation.

Return of the floor shift. Four compacts, four standard cars, and one U. S. sports car now offer floor-mounted shift levers in combination with manual synchromesh transmissions. They are: Corvair, Chevrolet, Chrysler (300-G), Corvette, Valiant, Lancer, Tempest, Studebaker Hawk, and Pontiac. More floor shifts are on the way. Pontiac, which now restricts this option to a very limited number of cars built with four-speed

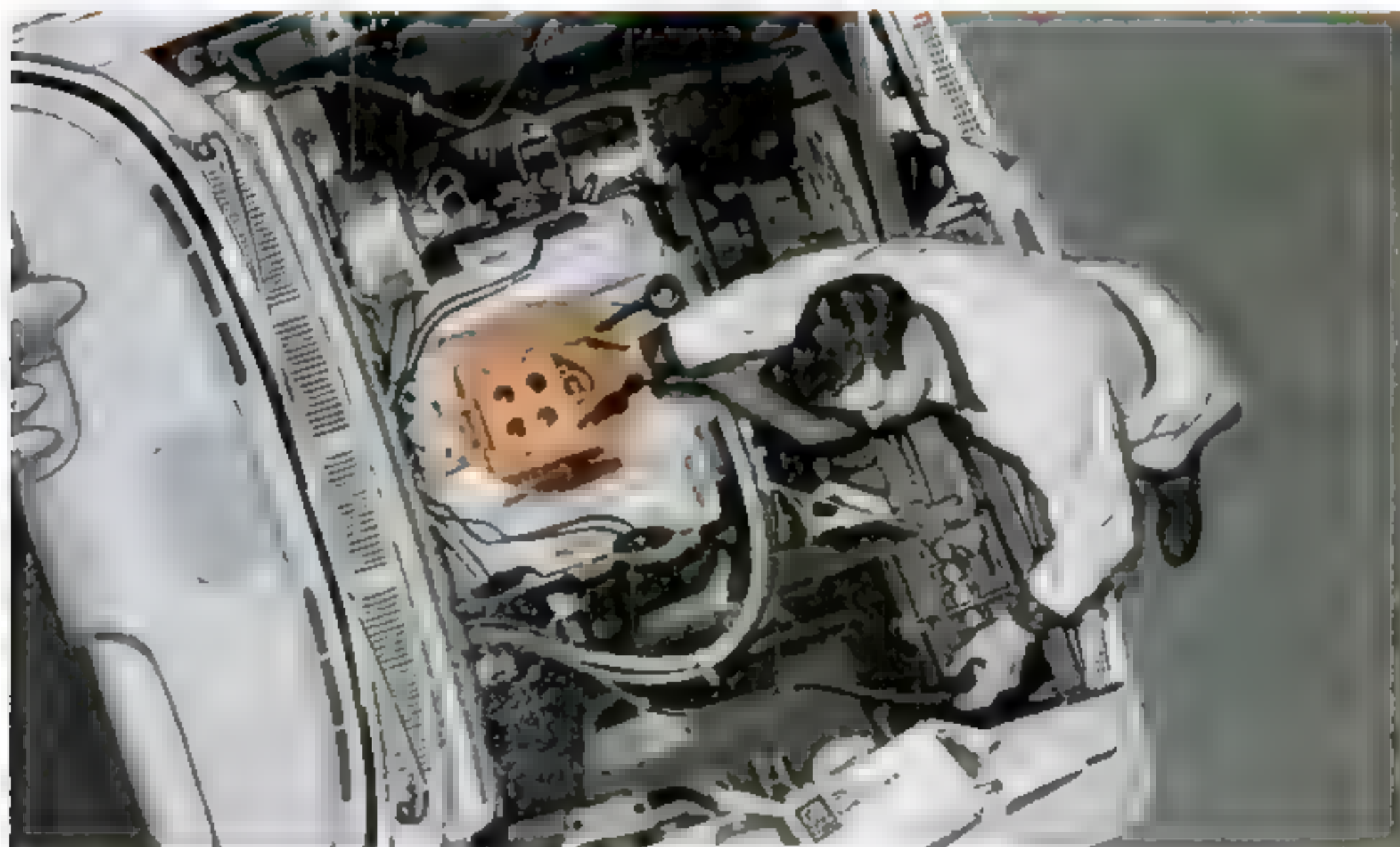
transmissions, reportedly plans to offer floor shift with three-speed gearboxes. Ford (whose T-Bird now has a shift lever sprouting from the center console) is likely to feature floor shifting on certain high-performance models of its full-size sedan line soon. Any new compact-compacts that appear probably will have floor-mounted levers. Main advantage: more positive shifts through elimination of spongy column linkage.

No-tip two-wheeler. Latest of the dreamy ideas from Detroit's never-never land is a sporty two-wheeled item by Ford called a Gyron, displayed at New

York's International Automobile Show this month. It's kept upright by a gyro-stabilizer. The catch: the gyro alone comes at a mere \$35,000 a copy.

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ROCHESTER CARBURETOR INSTALLED BY YOUR ROCHESTER SPECIALIST



Good carburetion is vitally important for your car's performance. When you need a carburetor replacement, it should be a carburetor factory calibrated to original GM quality and specifications. Obvious choice: a Rochester Carburetor. And you're assured top performance when it's installed by an expert. Obvious choice: a Rochester Specialist.

This reliable pair has what it takes to help you get the finest performance from your car's engine. That's because every Rochester Carburetor incorporates the most advanced engineering developments of carburetor technology. And every Rochester Specialist is factory-trained to know carburetors inside and out. Visit a Rochester Specialist!

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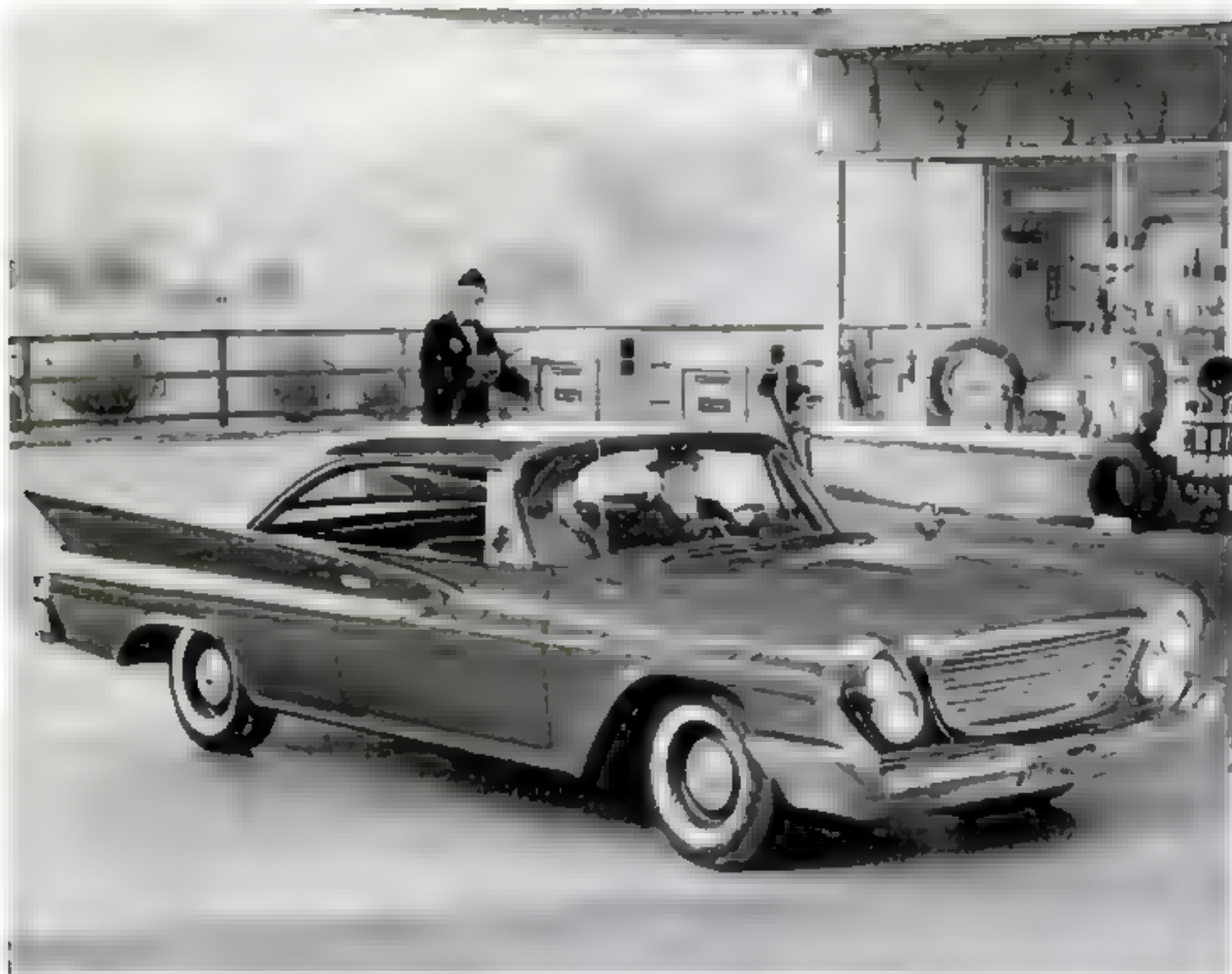
If top-quality service is your business ask your local UMS distributor about the many factory-approved service items in the fast-moving Rochester line.



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ROCHESTER CARBURETORS

ROCHESTER PRODUCTS DIVISION OF GENERAL MOTORS, ROCHESTER, NEW YORK



Chrysler Newport—A new, lower-priced Chrysler with a 361 cubic inch V-8 "tuned" to regular gas.

"Fill 'er up with regular"

In 1961 you can get a Plymouth, Valiant, Dodge, Dart, Lancer, or Chrysler that runs fine on regular gas

Standard equipment on every 1961 Chrysler Corporation make of car except Imperial is an engine that puts out its best on regular gas. There's the new Economy Slant Six that wrings 20% more go out of 15% less gas than our previous sixes; and a variety of V-8's including a big 361 cubic inch power plant.

And these cars have other good things, too. Like 7-soak rustproofing that protects looks and resale value. The amazing Alter-

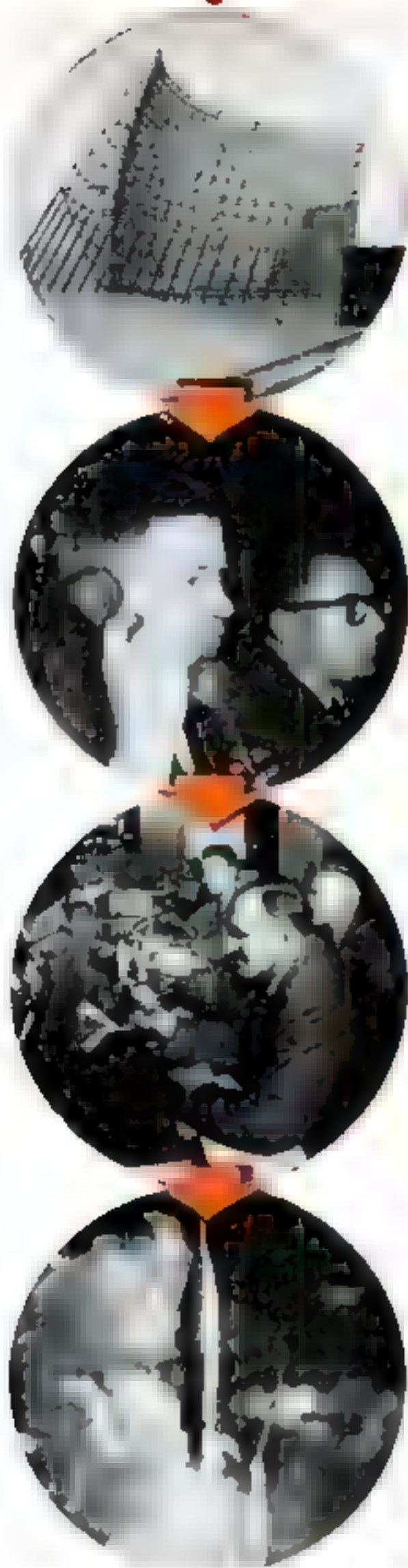
nator that keeps your battery charging even when the motor's idling. And strong, silent Unibody Construction.

Someday other cars will probably have their versions of these good things. But why wait? You can have them all, right now, as standard equipment in the 1961 Chrysler Corporation cars. And you won't have to pay any more for these cars than for similar models of other makes. See your dealer.

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Could a Radar False Alarm Trigger Atomic War?

By Martin Mann

Outshining Pike's Peak as a tourist attraction in Colorado Springs, Colo., is a tan concrete building on Boulder Street; the nerve center for American defense against air attack. Only Very Important Persons get in, but they come through on regular schedules.

Last October 5, several of the vippiest VIPs—including Thomas Watson of IBM and Charles Percy of the Republican National Finance Committee—were completing the grand tour. They had just been told what the numbers on the display board meant—that one panel shows how many missiles are attacking North America and the next panel shows how serious the raid is.

At that moment, 3:17 p. m. Mountain Standard Time, the numbers suddenly changed. The "raid estimate" flashed from its customary, reassuring zero to one, then four, then 99. Our radars had apparently spotted 99 missiles on their way. The "alarm level" went to five—very, very serious. The "test" sign was not on. The visitors were hastily ushered out. . . .

**Absolutely not, say
air-defense men.
Yet even the best
safeguards have
loopholes, opening
new dangers as
they close off others**

ONE bogymen haunting a hair-trigger world today is the false alarm. Could one ignite the holocaust of atomic war?

Radars make mistakes, see missiles and bombers when there are none. People make mistakes, misread signals. There are but 15 minutes for decision; that's how long it takes an ICBM to get from our outermost radar to a city like Detroit.

Suppose one of our men over-reacts to an unfounded warning—and needlessly pushes The Button to vaporize 5,000 years of civilization in fireballs and mushroom clouds?

Something like this *could* happen. It's not impossible. But of all the reasons for intelligent worry (and today there are many), the false alarm is pretty far down the list. Our defense system (and presumably the Russians') does not work that way.

Many high-placed people harp on the false-alarm danger. Yet they have apparently not looked closely enough



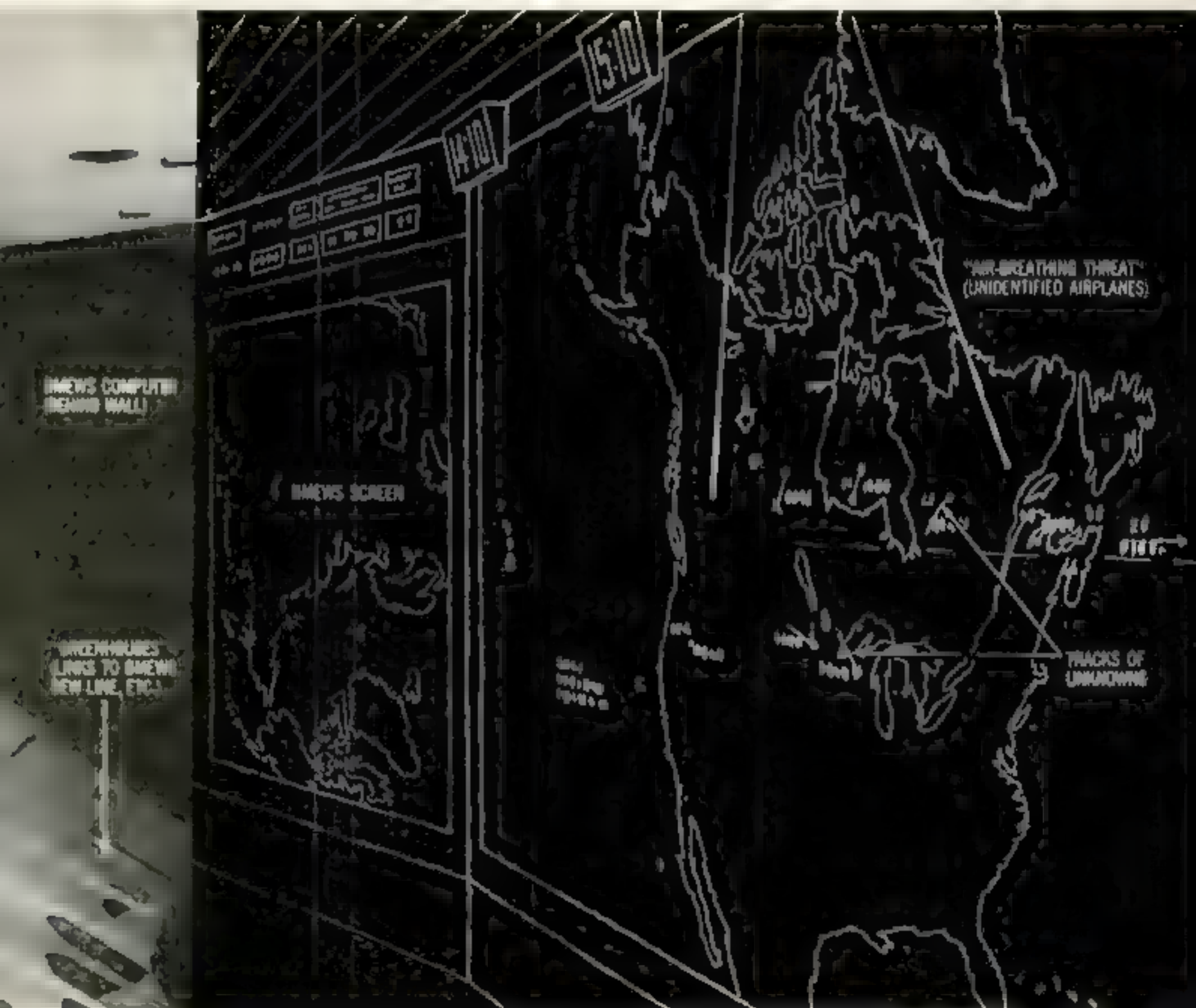
Real thing? False alarm?

Combat Operations Center, control point for American defense, is in constant touch with far-flung





Defense commander, flanked by advisers and watching situation on screens in front, must decide, outposts. Reports are displayed on giant map-screens (shown below by drawing for clarity)





NEWS FROM BMEWS—Our missile-warning radars—comes via direct telephone and teletypewriter to this "greenhouse" on Combat Operations Center floor. Maj. Glenn Perryman (right) sits at console where he punched out first warning of Oct. 5 "Moon Flap."



CLOSED-CIRCUIT TV relays big-screen situation maps and other data to monitors in important locations—nearby Battle Staff room as well as far-distant Omaha headquarters of Strategic Air Command. This speeds briefing, keeps commanders up on developments.

to find out why it is far down the list of likely catastrophes. No secrets are involved.

A many-layered fence of radar shields North America: Dew Line above the Arctic Circle, Pine Tree across Canada, picket ships and airplanes off both coasts, man-made islands in the Atlantic. They spot any airplane, but not missiles. One station in Greenland of the billion-dollar Ballistic Missile Early Warning System (BMEWS, pronounced bemuse) now looks for missiles. Two more are abuilding in Alaska and England.

When anything comes within range of these electronic lookouts, we know about it instantly. By radio, telephone, and teletypewriter—over circuits doubled and tripled for insurance—the signals come to the joint U. S.-Canadian North American Air Defense Command (Norad).

Inside that windowless blockhouse on Boulder St. is a Hollywood set designer's wildest dreams come true: a proper headquarters for pushbutton warfare. There are walnut-paneled walls, carpets, glowing screens, flicking lights, TV monitors, hundreds of telephones of every color and complexity. The place is absolutely loaded with push-buttons. There must literally be thousands. They light lights, change symbols, and switch telephones. But not one will launch so much as a Piper Cub, let alone an ICBM.

On the alert. The man who minds the store is a captain or a major, the Controller of this Combat Operations Center. He is flanked by assistants and the paraphernalia of modern communications. In front of him is a three-story-high screen on which ingenious slide projectors throw a map of North America and draw the tracks of all "unknown" airplanes (there are usually half a dozen unknowns—harmless planes accidentally off their prescribed courses). To the Controller's left is the BMEWS screen, on which the projectors throw an above-the-North-Pole view of Europe, Siberia, and North America. If BMEWS spots missiles, their launch sites and targets (automatically calculated) appear on this map. Number-display panels—they look like the tote board at a race track—indicate additional facts, such as the number of missiles detected, the time they will hit, and the number of our planes that are ready at different bases.

Capable as our junior officers may be, they don't make even medium-size decisions. A general or senior colonel is always on deck, 24 hours of every day. And when the screens show trouble he calls in the Battle Staff: four-star General Laurence S. Kuter or his deputy, Canadian Air Marshal Roy Slemon, and a brass-loaded retinue of advisers.

This is the first precaution against false alarms, the collective judgment of experienced men.

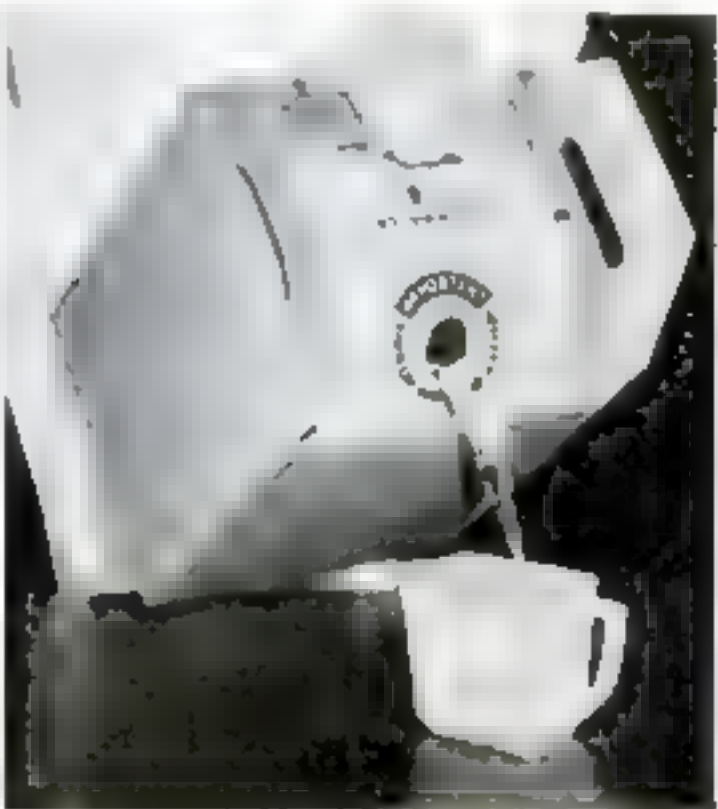
The second line. General Kuter can order up defensive fighters, but not the Sunday punch of retaliating bombers. He can send an alarm via the yellow-telephone hot line (always ready for talking) to Strategic Air Command at Omaha, Neb., to Washington, and to Ottawa. SAC General Thomas S. Power can order his B-52s and B-47s off

[Continued on page 224]



Beep, beep, goes this little sheep

Selected sheep in flocks pastured all year are wearing strapped-on radio transmitters like the one above. Movement of the sheep's jaws while feeding opens and closes a switch that causes a signal to be sent to a receiver. Rapidity of the signal gives information on when the sheep feeds and upon what.



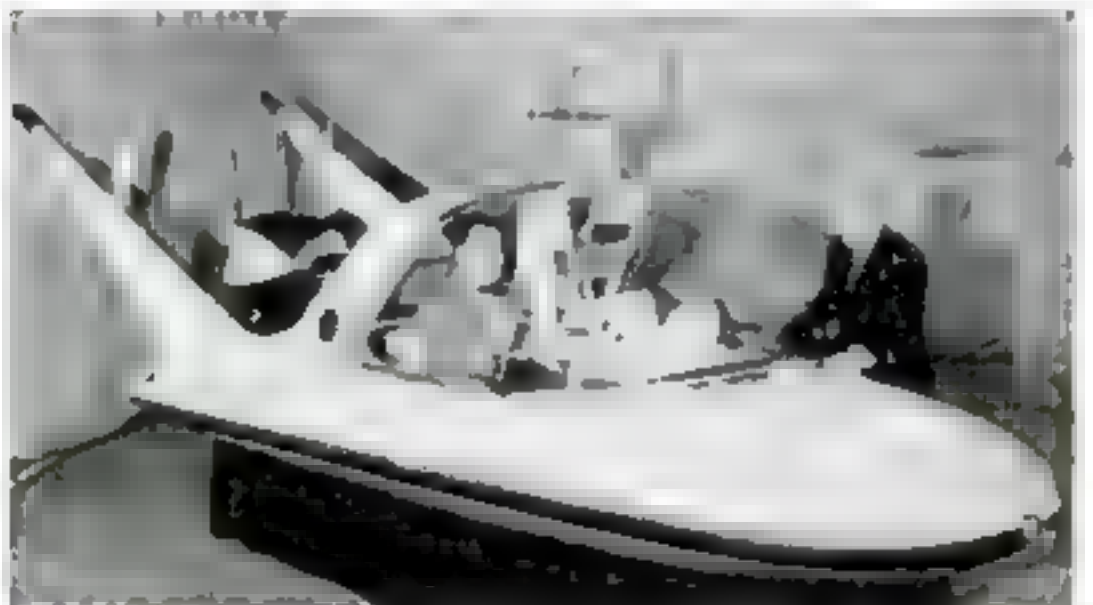
Pouring from a box

Nonreturnable containers for beer, milk, acids, alkalies, paint, and many other liquids are being made in England with a plastic liner clad in heavy-duty corrugated cardboard. The light five-gallon jugs have leakproof screw caps and cut-out pouring and handling grips. They will burn easily when empty.



Air-launched Skybolt

A prototype of the hypersonic Skybolt—first and only U. S. air-launched ballistic missile—is shown here under the wings of a B-52G Stratofortress. When it becomes operational in 1964, the new Douglas missile will be carried by the longer-range Boeing turbofan B-52H, giving that more-than-10,000-mile superbomber an additional target strike of some 1,000 miles.



On or over the bounding main

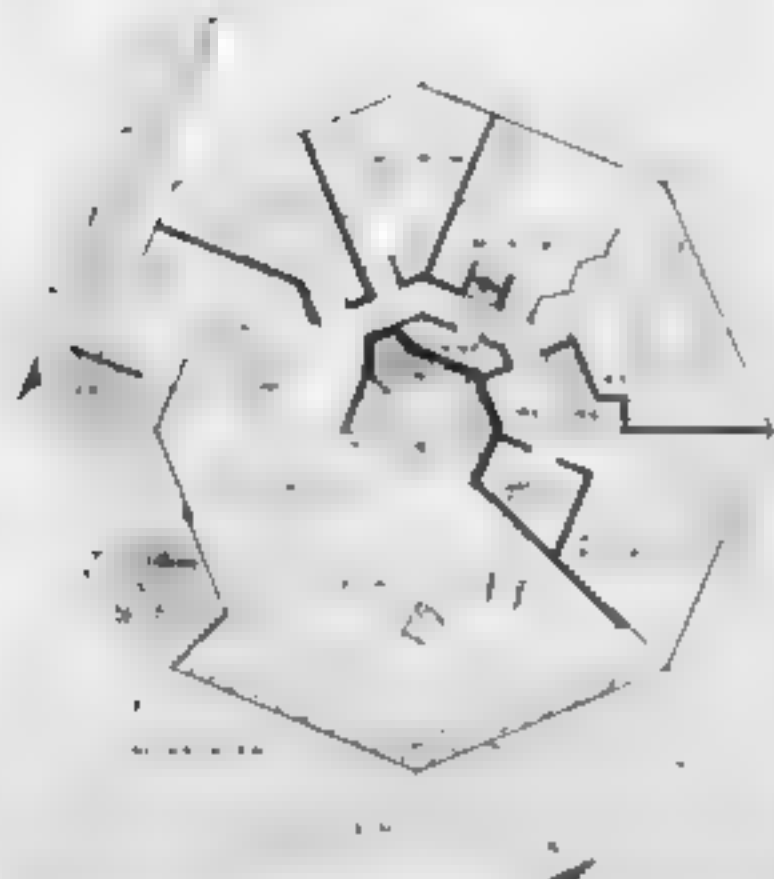
Most out-of-this-world of Evinrude's series of annual dreamboats is this bubble-top outboard with a helicopter rotor. The Heli-Bout was conceived by designer Brooks Stevens—as Evinrude puts it, "to encourage boat builders to free thought in seeking new and improved design concepts." Theoretically, its owner could take off with a passenger from his back yard and land on his favorite lake. Its folding rotor is connected by flexible shaft to a 75-hp. outboard. No flight test yet.



PICTURE WINDOWS ALL AROUND afford a panoramic view of the Hollywood Hills. House is

set off-center on its concrete column to absorb extra stresses in case of earthquake.

Toadstool House Is Reached by Cable Car



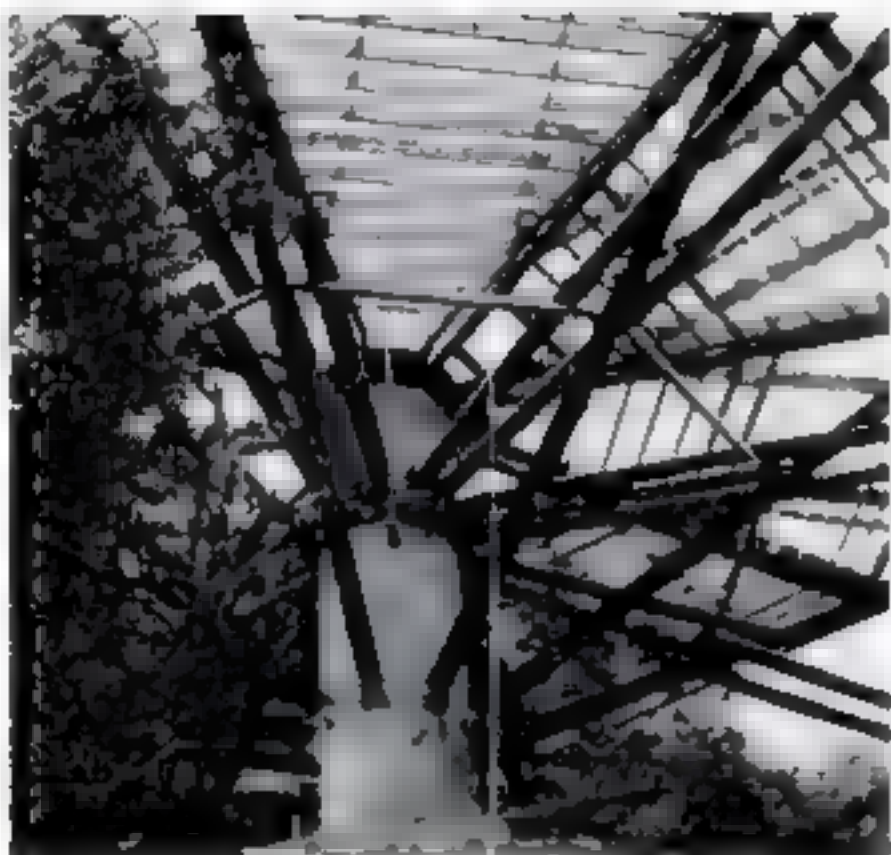
FLOOR PLAN shows careful use of compact floor space. Ten rooms and two baths add up to 2,200 square feet. Gas appliances include built-in range and oven, automatic washer and dryer, and year-round air conditioning.

ON A steeply sloping hillside overlooking California's breath-taking San Fernando Valley stands what looks like an enormous, top-heavy toadstool.

It's one of the most unusual houses ever built. The cap is a 2,200-square-foot octagon perched—precariouly, it seems—on a 30-foot concrete column. But the fragile appearance is deceiving. Buried in the hillside and bonded to the column is a pad three feet thick and 20 feet across that makes the house strong enough to withstand earthquakes, landslides, and tornadoes.

John Lautner, an architect with highly individualistic tastes, designed the house to conform to the site. It was built by its 28-year-old owner, Leonard J. Malin, who brought in outside construction help as needed. The Chem Seal Corp., a Los Angeles chemical company, sponsored the project to test its bonding and sealing materials.

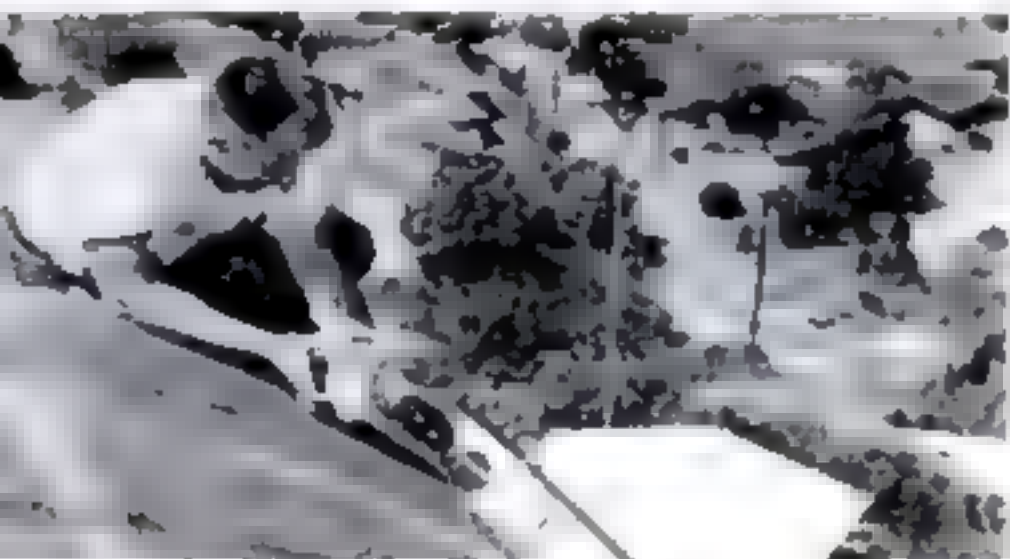
Though the house is in the luxury class (\$100,000), much of its design could be applied successfully to cheaper homes.



EARLY CONSTRUCTION PHOTO shows concrete column anchoring the steel cantilevers that support the house. Column is hollow with steel-reinforced walls five feet thick. Tough, flexible compound beds the beams to the house.



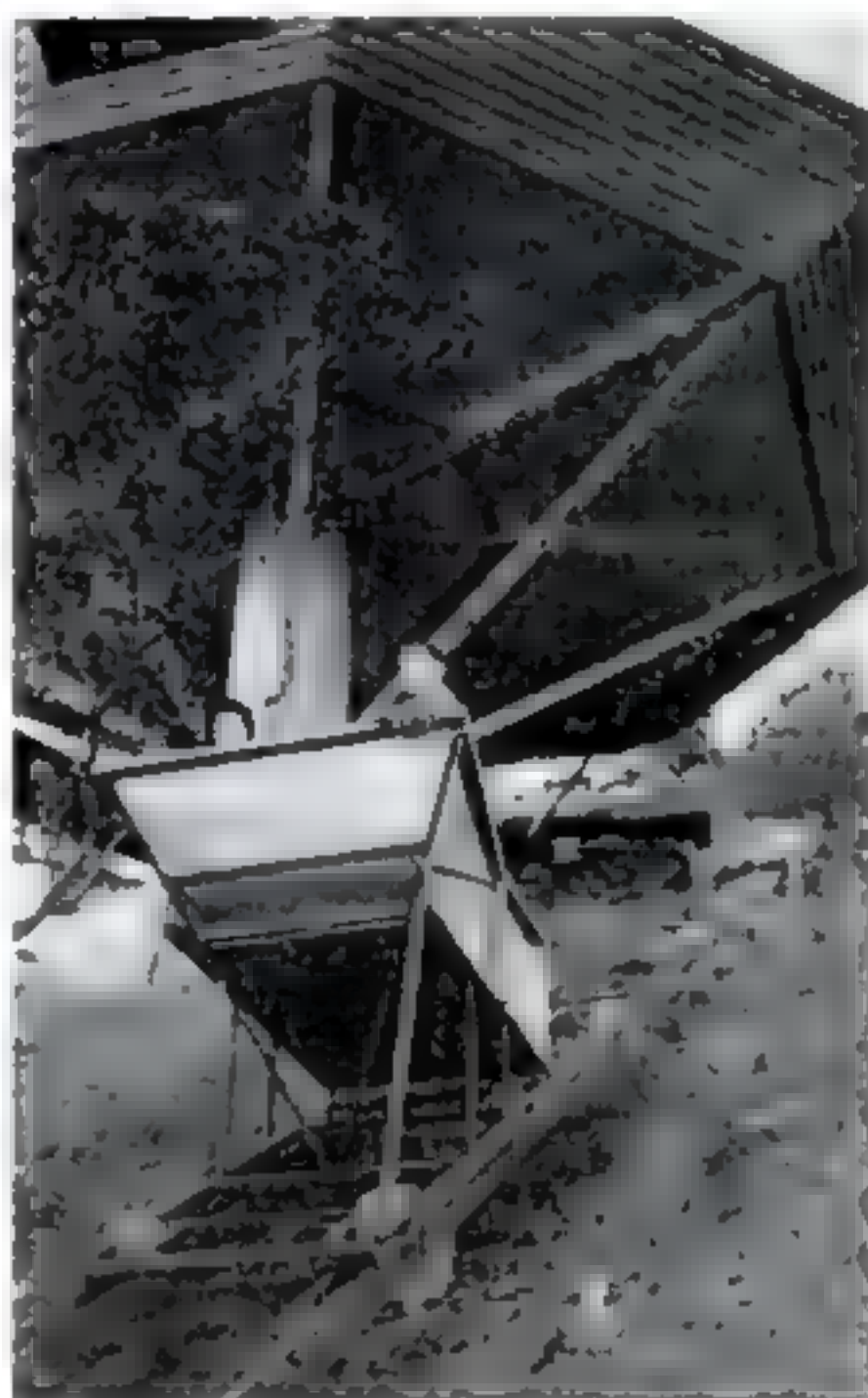
HIGH-LINE brought to the site all building materials and appliances (like this oven). Lines were strung on telephone poles; two lashed together towered 70 feet on downhill section. Winches lifted and pulled the loads.



SINGLE-MEMBRANE ROOF, an integral part of the house, is basically a composition wood pulp. Fiber-glass tape seals joints, does job of metal gutters. Here owner is swabbing on epoxy sealant. Roof's estimated life: 40-50 years.



ROOF BEAMS are of laminated wood for greater strength and less weight. Left exposed to the eye, the neutral-stained beams are here being sprayed with a clear epoxy coating for protection and appearance. Interior of the house complements the octagonal exterior design.



FOUR-PASSENGER CABLE CAR plies the 125-foot track from lower driveway to front door. Still unfinished, car soon will wear an aluminum skin. Since photo was taken, ties were laid between the tracks: three safety anchors catch on the ties if the cable goes slack.



MOTORIZED HANDLEBARS cost \$100, but do absolutely nothing—without accessories. Edger-trimmer at left costs about \$30, the free-wheeling rotary mower about \$50. Also available are a tiller, lawn vacuum, tractor, and many other snap-ons. Known as Terra Task Force, the line is made by Moto-Mower, Inc.

New Yard Machines

Turn Work into Play

By George Daniels

A SLEW of wonderfully versatile new machines is taking the work out of gardening and yard maintenance. Chances are these super-tools already have reached your local hardware store. Some of the most unusual are:

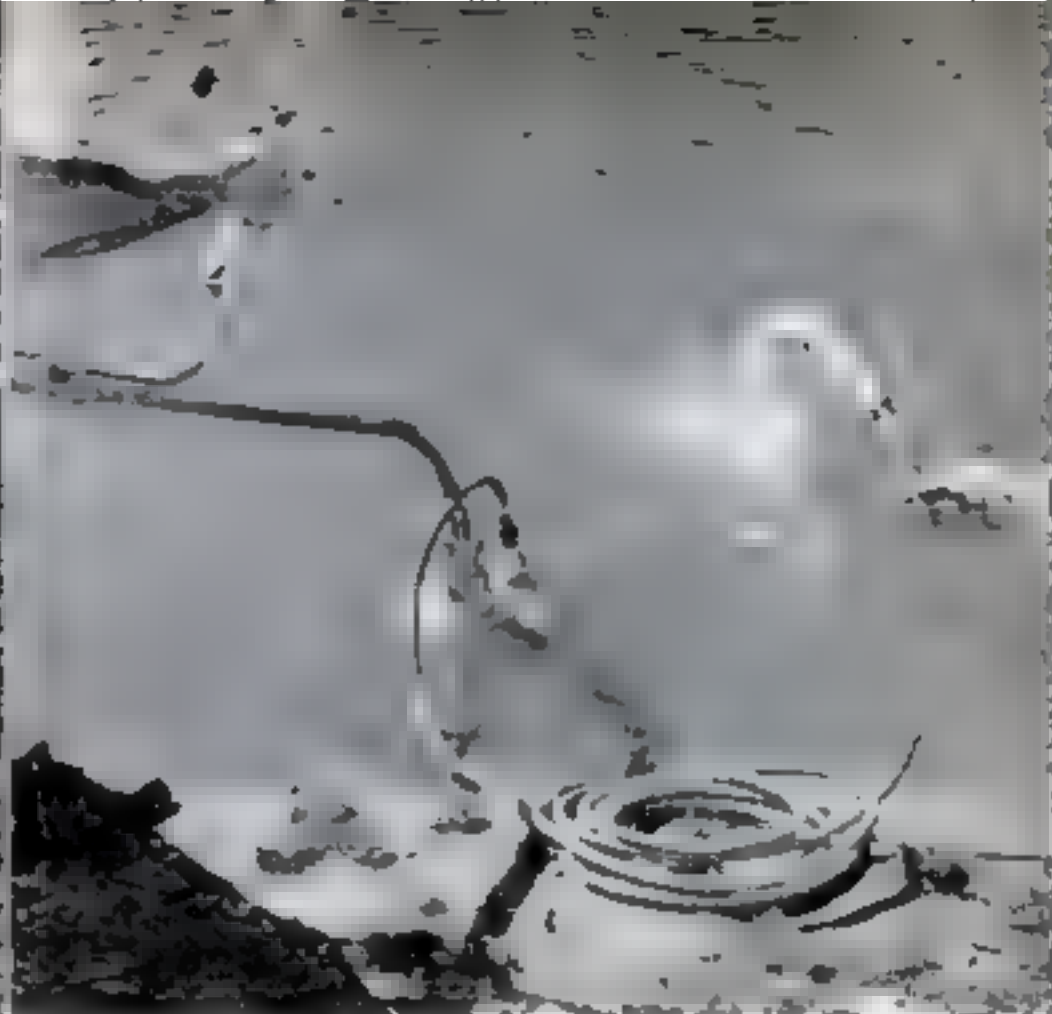
- A rotary mower that fells trees and

chops them into firewood, trims hedges, and tills the garden.

- A garden-hose sprinkler head that slithers unattended around your house, sprinkles the lawn, then shuts itself off.

- A mammoth vacuum cleaner that jets the leaves on your lawn into sacks at 200 m.p.h., and also cleans your furnace.

- A power scythe that cuts trees at



SHOULDER STRAP makes carrying the Turfmaster power scythe easy. Saw-blade attachment at left is starting in on a sapling. At right, scythe with pump attachment displays its pool-emptying abilities. Aiming the spray back into the drink doesn't accomplish much, except to show off the unit's 6,000-gallon-an-hour capacity. Price of the scythe is \$140, plus \$5 for the tree cutter and \$40 for the centrifugal pump. Also available is a rotary cultivator for another \$40.

THAT EXTRA \$695 knocking around in your cookie jar can buy you a nine-hp. Gilson garden tractor with electric starter, headlights, contour seat, and Jeep-like fenders. Underslung rotary mower extends beyond wheels to cut close to obstacles. Snow-plowing, cultivating, and tilling attachments are available.



HUNGRY FOR WEEDS, tree cuttings, leaves, and other garden wastes, the Gilson chopper takes them in and spews out hash that makes fine top-soil dressing. The smallest model costs about \$120; this three-hp. unit is about \$270. The man in the dark glasses, at left, seems a bit apprehensive about the whole thing.



ground level, cultivates your garden, and pumps 6,000 gallons of water an hour out of your swimming pool.

These luxuries don't come cheap, but they do add up to lots of extra leisure for the leisure class. Take the all-too-familiar job of lawn-mowing: A new 30-inch rotary will trim your grass nearly twice as fast as an 18-incher and practically pay for itself in shoe leather.

For the indolent type who disdains trudging behind a mower, a riding model is the thing. If this is still too Spartan, you can buy a garden tractor with headlights (for mowing in the cool of the evening) and two-tone paint.

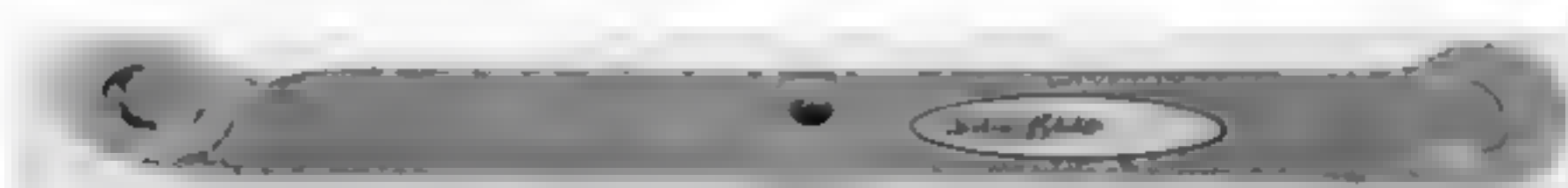
Mowing is only part of today's mower

story. With a few simple hand tools and 15 minutes' work, the removable motor in one rotary becomes an outboard powerful enough to push a 14-foot boat. Not bad for a lawn mower.

Even when summer ends, your new tools will ease your outdoor jobs. Come next winter, slide into your garden tractor and whisk snowdrifts off your driveway. If you're hemmed in by walls or banks, attach a snow thrower to pulverize the stuff and shoot it high and out of the way.

If you can't afford all these mechanized marvels, at least you'll have something to think about as you push your trusty hand mower.

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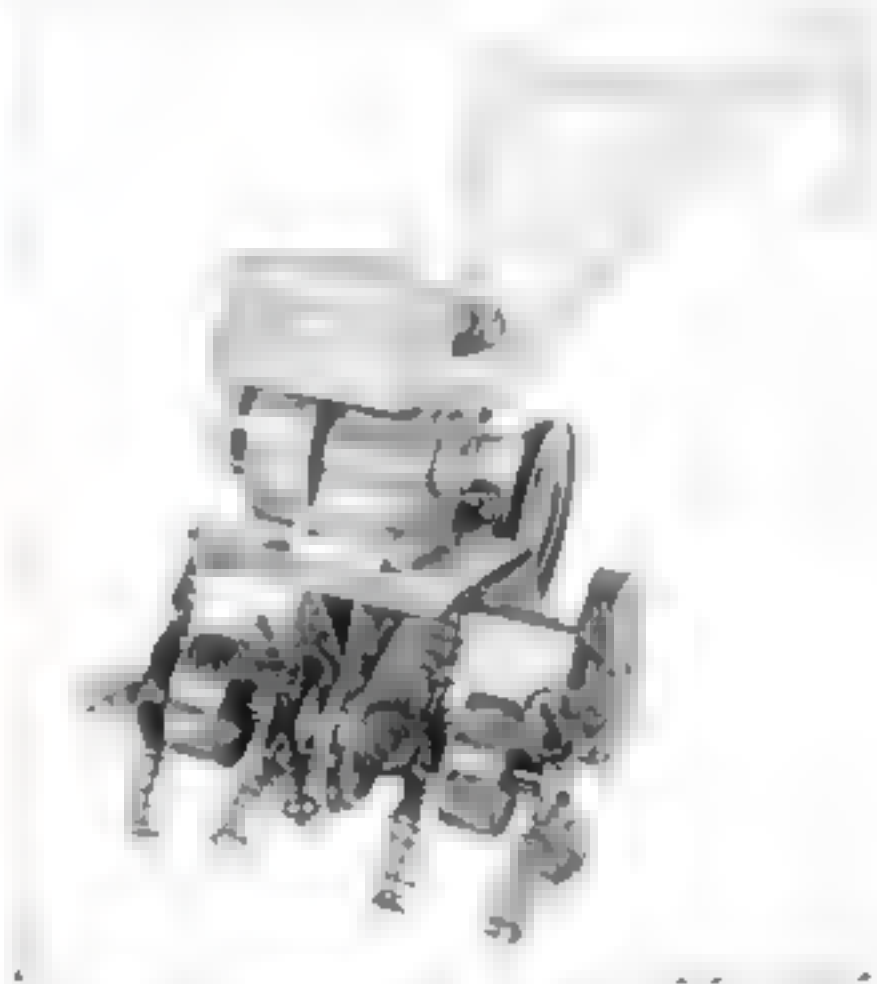


NO DULL EDGES with the *Busch Sabre Blade*. Simply give the razor-edged washers at each tip a slight twist to put a new sharp edge in cutting position. If the blade hits a stone or other obstruction, the washer turns automatically. Blades are made for all rotary mowers. Typical size: about \$5.

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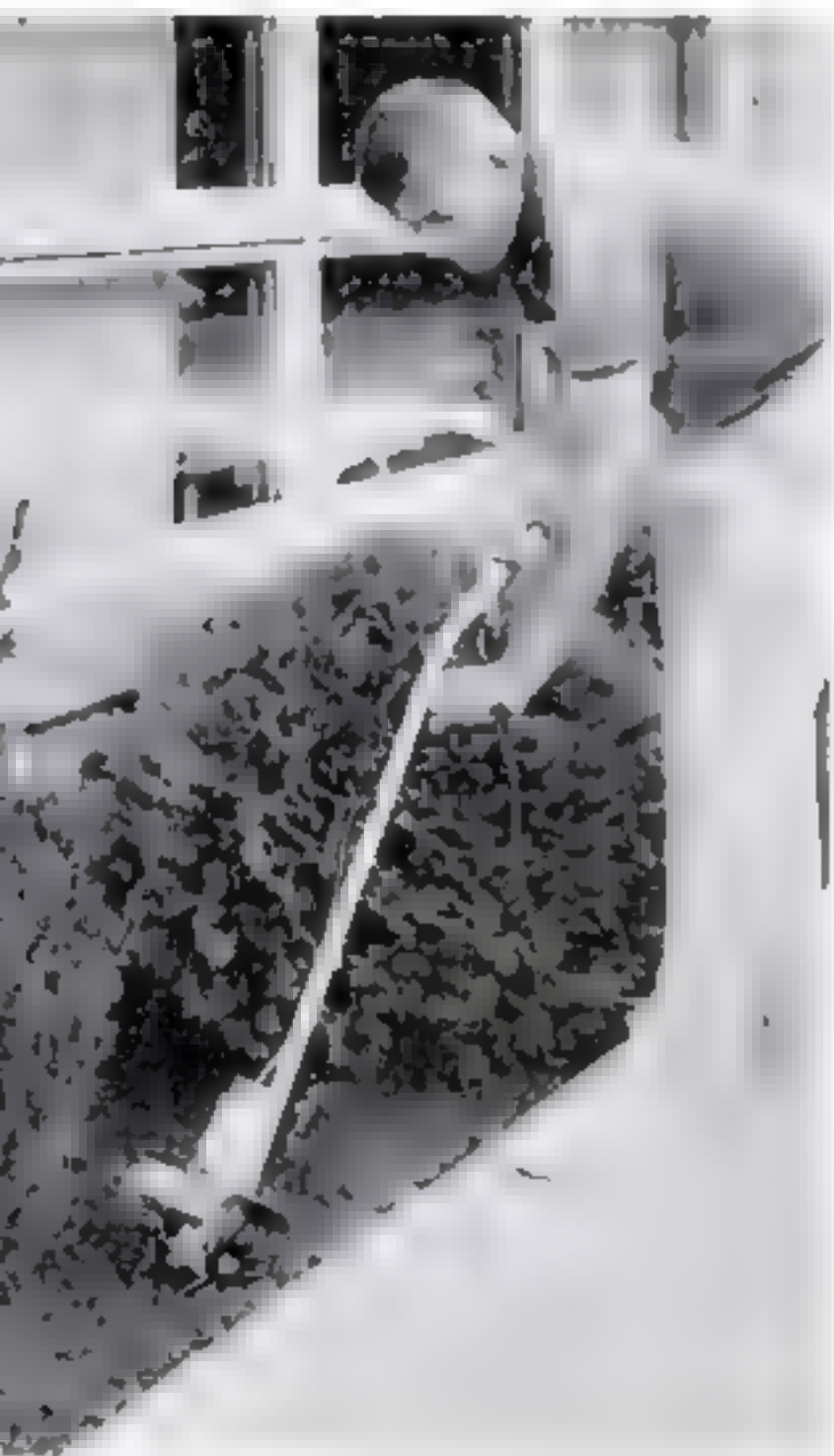


LIGHTWEIGHT GARDEN TILLER puts the fun back in gardening, says the manufacturer. The *Lawn Boy Hobby Gardener* comes with five different attachments. Price complete is about \$100. Shown here is the weeder, with a star-shaped blade for cutting away weeds and crabgrass in flowerbeds and other hard-to-reach places. Also included: hoe, edger-trimmer, tine, and extension arm.



PLANTING, FERTILIZING, CULTIVATING are done by the *Planet Jr. Planetiller* with the help of various attachments. Shown here are aerators mounted on the power unit. Each aerator has four steel "spoons" that pop out earth plugs; the first rainfall dissolves the plugs and levels the ground. The springs hold down surrounding sod. Power unit costs about \$189, the aerator assembly \$66.55.

AUTUMN LEAVES don't stand a chance against the \$200-and-up **Giant-Vac**. This garden vacuum cleans a 30-inch swath, pulverizes the leaves, and packs them in a sack at 200 m.p.h. A \$30 blower attachment piles up the leaves for easy burning. Hose attachments enable you to clean furnaces, too. The machine can also be used to load feed into a bin, direct a flow of air into excavations, and draw out smoke after a house fire. Large-diameter ball-bearing wheels have puncture-proof tires. Power is supplied by either a three- or five-hp. Briggs & Stratton engine.



COMPLETE BEAUTY TREATMENT for your garden is offered by Central Stamping's cultivator. The \$35 power tool works 10 times faster than a hoe; it also loosens broken soil and aerates. Rake teeth at the rear act as leveler. The Kul-T-Vator uses same wattage as the average home hair dryer.



FOR THE MAN WHO NEEDS EVERYTHING, a Mead Speedcat baby crawler tractor with bulldozer or loader attachment is just the thing. It's slightly over a yard wide, weighs over a half-ton stripped, and has a nine-hp. engine that provides a 2,000-pound drawbar pull. It grades, excavates, mows, and plows—all for about \$2,000 plus attachments. Dozer blade: \$75. Plow: \$59.



CONVERTIBLE MOTOR works on lawn or lake. Pennsylvania's \$100 free-wheeling rotary mower (left) becomes an air-cooled outboard motor (right) capable of powering a 14-foot boat. The \$106 conversion kit includes the drive-shaft assembly and finned exhaust manifold that leads to an underwater exhaust duct. The switch-over takes minutes and requires only a screwdriver, two flat wrenches, and an Allen wrench. Re-installation of the motor on the rotary mower is just as easy.



SPINNING SPRINKLER atop the H. B. Sherman hose reel powers the drive wheels through a gear train. The reel follows the laid-out hose at 20 feet an hour, reeling it up as it goes, and takes 175 feet of hose. Price is about \$50. A budget version of this educated sprinkler, priced at about \$28, doesn't reel up the hose but crawls along it, dragging a long loop behind. You have to roll up the hose by hand. The latter model offers two wheel sizes, allowing you a choice of two crawling speeds.



JACK OF ALL GARDEN TRADES, this Pennsylvania reel mower chops down trees, digs up your garden, and gives hedges a haircut. The mowers range from \$130 to \$157. Cable-attachment unit is \$62.45; chain saw, \$120; tiller hoe, \$83.50; hedge trimmer, \$32.50; detachable clutch, \$32.50.



NO GEAR-SHIFTING with the Homelite Yard Trac garden tractor. It has an automatic four-speed transmission. A 4½-hp. engine and limited-slip differential enable the tractor to handle steep slopes and wet grass easily. Prices start at \$285, or \$329.50 with a rotary mower. Parker Springfield lawn sweeper cleans a 28-inch swath and holds eight bushels. Price: about \$60. Homelite also offers rollers, plows, aerators, seeders, and other attachments.

Safety features you should look for in a power mower

A power mower takes a load off your back, but it can also take off your fingers or toes, or even kill you. Faulty design makes some machines more dangerous than others.

Dismayed by the mounting accident toll, mower manufacturers got the influential American Standards Association to help with safety specifications. Now an official American Standard B71.1-1960 has been published to spell out acceptable design. Many mowers on sale this spring carry seals or tags stating that they conform to the new safety standard. If you don't find such a statement you can check some safety points yourself.

Standard B71.1-1960 for rotary mowers requires or "advises" that:

- The blade should never extend below the sides or rear of the enclosing deck except at discharge openings.
- The tip of the blade should come no closer than three inches (five inches on riding mowers) from the end of the discharge

chute, unless a fixed bar guards the chute opening.

- A prominent warning should be marked at danger points (such as discharge chutes).
- The engine should have a positive off-on switch.
- If the blade is not one-piece, the separate cutters must be positively fastened to their rotating holder—no brazing or welding.
- The tip of the blade should spin no faster than 21,000 feet per minute.
- Electric mowers should give an audible or visible warning when the blade spins.
- An automatic stop should prevent the center of the handle from swinging closer than 17 inches behind the blade (except on electrica, which may have swing-over handles to avoid cutting the cord).

For reel-mower approval, the new standard requires a control that positively disengages the wheel drive, and urges guards for belts, chains, and gears.

"I'd like to see them make..."



V-SHAPED EXPANSION JOINTS in railroad track. This should eliminate the familiar and annoying

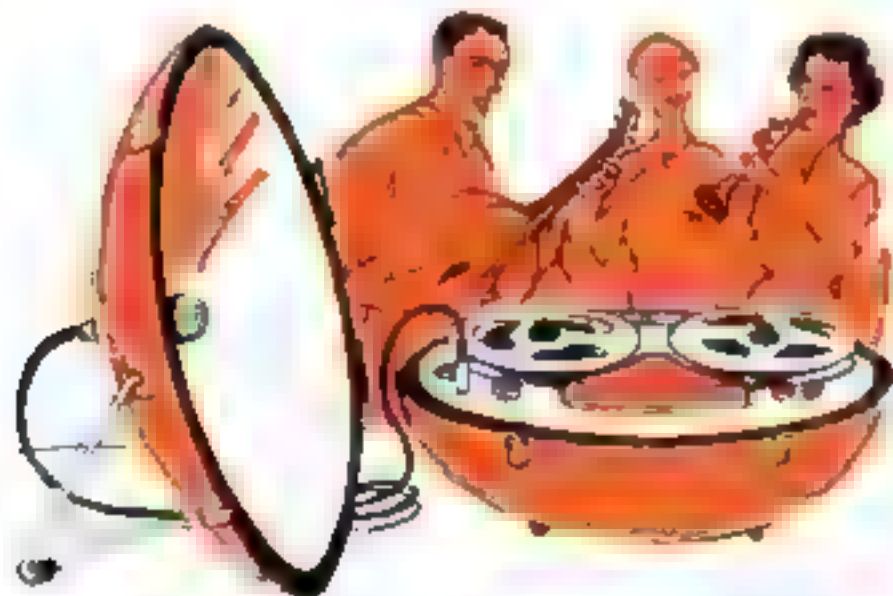
clickety-clack of trains riding the rails.—*Warner Walker, Exeter, Calif.*



SAFER DRILL PRESSES with on-off switches actuated by the chuck key. There would be an auxiliary pushbutton for fast emergency stops, too.—*PFC J. E. Kaphusman, Dundalk, Md.*



MINIATURE AIR HAMMERS, the shape and size of a hand drill. They'd be useful in tight or hard-to-get-at places where a regular hammer won't reach.—*H. M. Gilbert, Kalamazoo, Mich.*



CLAMSHELL CASES for tape recorders. With a mike fastened with a clip at the center, the open lid would become a parabolic sound reflector.—*Walter Shelton, Amarillo, Tex.*



FULL-OUT NOZZLES on cars so you could pour gas into the tank more easily. Often a fender gets in the way of pouring from an ordinary can.—*Dean E. Harding, Guilderland, N.Y.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by **POPULAR SCIENCE** readers. What's

yours? We will pay \$5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.

WHAT'S NEW on the Water.....



Three-Piece Matched Set

For the first time, one manufacturer has created a boat, motor, and trailer made for each other to provide maximum efficiency and performance.

It's the new Flying Scott combination—a luxurious 17-foot boat equipped with a specially propped 75.2-hp. motor. A trailer, perfectly fitted to the hull, completes the outfit.

Using the new Scott Imperial oil permits a 40:1 fuel-oil ratio, saving as much as eight cents a gallon over the 20:1 mix

commonly used to operate outboards.

Foam flotation, installed under the forward deck and gunwales, holds the boat level and right side up even if filled with water. The Flying Scott is unsinkable, according to the manufacturer.

The boat and motor are sold as a unit at \$2,995. Price of the trailer (not shown above) has not yet been established. The trio is made by McCulloch Corp., Marine Products Div., 2700 Winter St. N.E., Minneapolis 13, Minn.



TIRE-TUBE BOAT.

You buy the plywood deck and tubular steel frame for \$30, then add three 15-inch car inner tubes to complete this unusual portable craft. Oars, oarlocks, and seat are permanently attached to the frame. A motor mount will accommodate any small outboard. The "Go-Boat" will carry 300 pounds safely, and draws only four inches of water.

The 30-pound outfit fits in a station wagon or car trunk, or it can be carried on top of the car with the tubes inflated. Hopkins Mfg. Co., Emporia, Kan.



YEAR-ROUND AMPHIBIAN.

This 28-foot catamaran houseboat never stands idle. In summer it's a spacious cruiser that can be hauled to the water on retractable wheels. Come winter, it can

cruise the highways as a house trailer, or be set up as a cabin for hunting or winter sports. Price, fully equipped but without motor, is \$4,995. MacDonald Mfg. Co., New Baltimore, Mich.



TINY TUG. Originally built for his young son by a marine dealer, the miniature tugboat at left has made a big hit—with a sale of more than 130 reported since it went into production last November.

The superstructure is built on a 12-foot molded-plywood hull. There's seating space for several youngsters inside the cabin, a walk-around deck with handrails on the cabin roof, and steering by a regular ship's wheel inside the pilot house.

The tug will perform nicely with any motor from 3 to 7½ hp. Price without motor is \$395. Whirlwind Boats, Cockeysville, Md.

MOTOR BRACKET.

This retractable device fits all sailboat transoms and will hold any small motor up to 7½ hp. clear of the water, yet ready for instant use if the breeze should fail. When auxiliary power is needed, you just flip the bracket down and latch it in place. McElroy Mfg. Co., 5619 East Independence St., Tulsa 15, Okla., sells the lightweight aluminum bracket for \$29.95.





Despite wetly icy roads in Alpine passes, light rear loading, and no snow tires or chains, the Peugeot 404 scooted up without wheelspin. That's Mount Blanc glowering in the rear.



Not only was descent a trifle dangereuse—unsanded wet ice on a crumpled hairpin road without fences—but the mountain hamlet here was well named. It was Héry.

Slam the 404 around a bend at the limits of tire adhesion, and this is all the lean you get. Taken at Peugeot's test track.



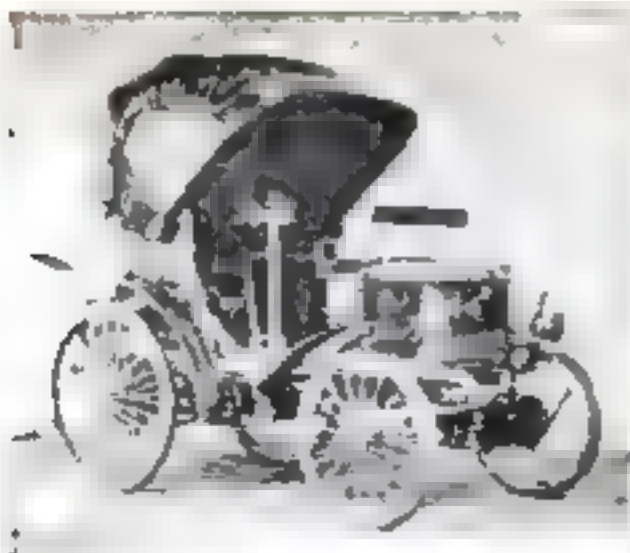
New French Import

Peugeot's new 404 is close to U. S. compacts in size—but not in machinery or personality

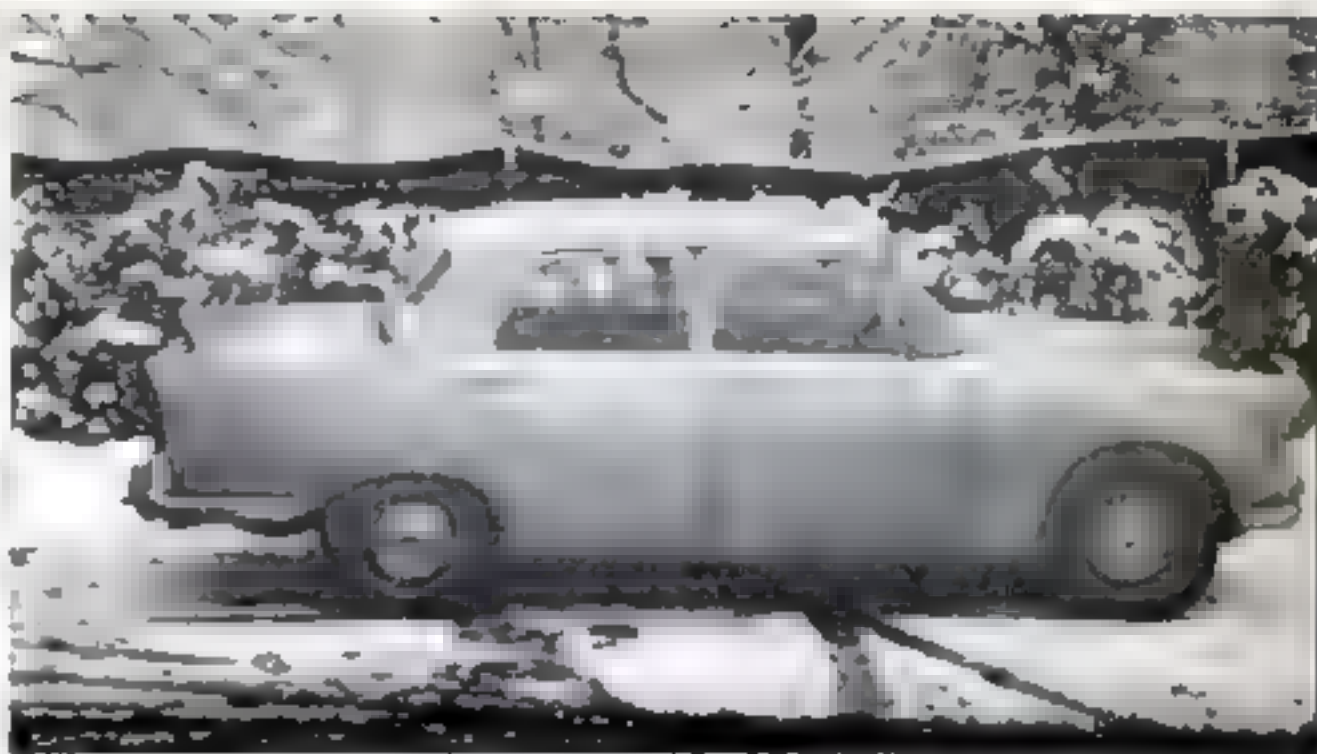
IF YOU happen to be driving abroad, much can be said for doing it in a European car. In Geneva recently I saw an American timidly maneuvering a U. S. station wagon through choked and

narrow streets. Caught in a swirl of agile, darty little cars, his wagon appeared enormous; it looked as if a paddle-tennis match could be staged on its hood, with bleachers erected for crowds of spectators on the roof.

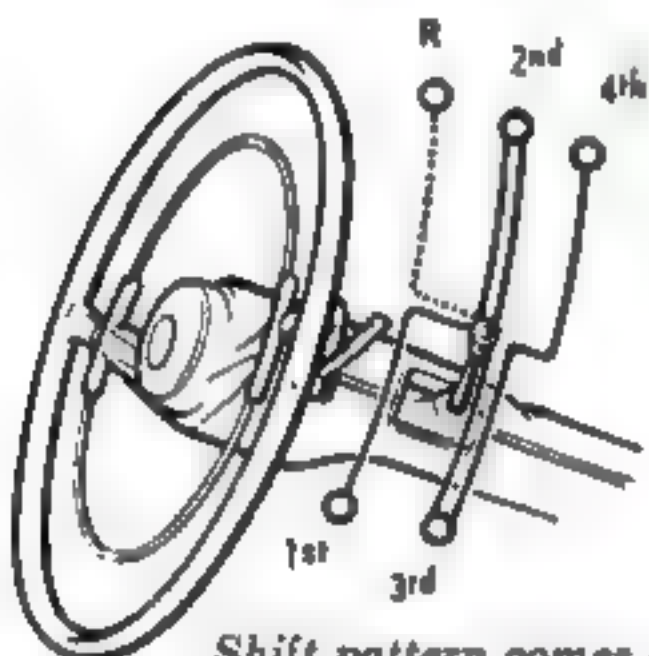
On its driver's face was the peculiarly agonized expression of a man whose children were all clamoring for a rest room. What made his problem haunting was the



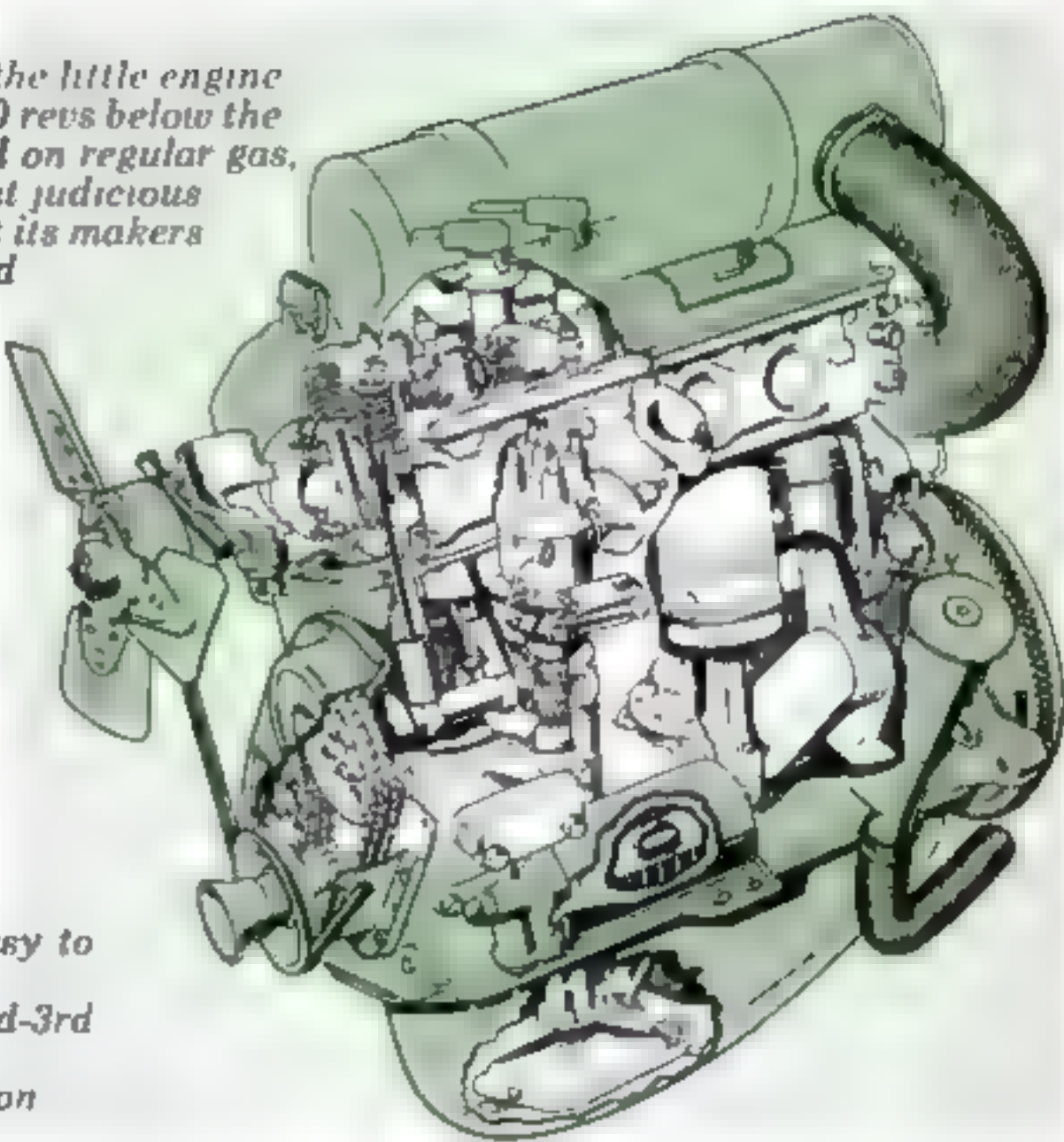
Sixty-four years separate these two Peugeots. New 404 is added to the line, won't replace earlier 403 model yet.



Incredibly smooth for a four, the little engine peaks at 5,400 r.p.m., about 500 revs below the point of valve float. Contented on regular gas, it gives 72 hp., well under what judicious souping could get from it. But its makers (and past buyers) have prized durability over flash.



Shift pattern comes easy to U.S. reflexes. Lever is spring-loaded in the 2nd-3rd plane, to give drivers a handy reference location



Is a Saucy Performer

fact that he clearly had to search for not one but two vacant parking places.

Another spot abroad where the local vehicle shines is in the gas station. I was driving a spanking-new Peugeot 404 and, thanks to the solicitude of its owner, rarely had to refuel it myself. Once, though, I did have the tank topped—it was at the approach to a particularly formidable Alp—and the half-empty tank took about

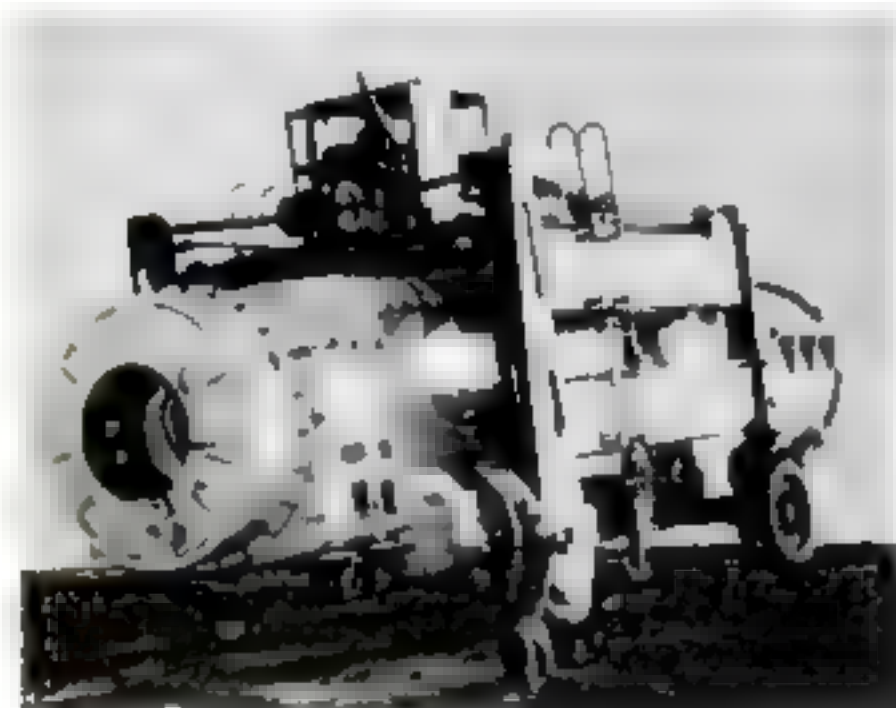
six gallons. Forking over the almost eight dollars that this modest sip cost, I was sobered by the realization of what it might be like to drive a really thirsty car abroad. The Peugeot, which drank daintily at the rate of 29 m.p.g. except when spurred fiercely, was excellent in this respect. But he who motors abroad in a big U. S. car might be well advised to set out

[Continued on page 208]



Modern spinning wheel

Being spun into grooves on the rim of this wheel is 700,000 feet of fine nylon-coated copper wire. Eight of the wheels are being made in the Boulder, Colo., laboratories of the National Bureau of Standards. They will be used in various parts of the world as antennas to detect pulsations of electromagnetic waves believed to originate in the ionosphere.



Straddled missile

One of the Navy's submarine-launched Polaris missiles takes a ride here over rough terrain between the long legs of a straddle carrier. Encasing the rocket is a 50,000-pound container fitted with shock absorbers. Clark Equipment Co., Battle Creek, Mich., built the carrier.

Dragon trombone

Music from the slide trombone at right comes out of the mouth of a bell shaped like the head of a dragon. The fierce-looking horn is a 19th-century Chinese instrument. It was displayed at a Rome exhibition.



Fan-shaped stairway

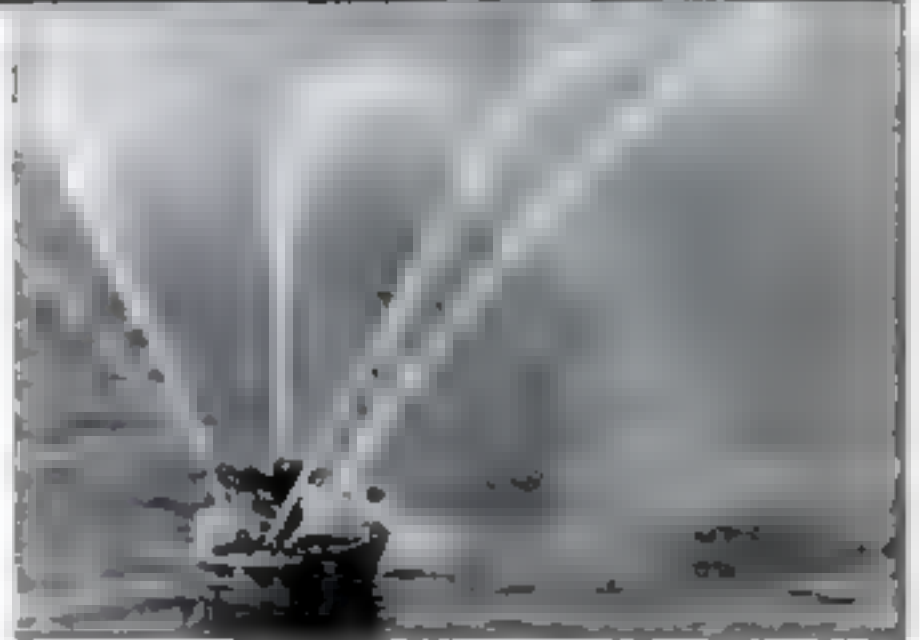
Circular staircases like this 2½-ton assembly being hoisted into place are mass-produced at an experimental building project in Czechoslovakia. Individual "keys" are formed of prestressed concrete, stacked, and locked together by steel rods cemented in the hollow core.



Jet propels boat at 35 m.p.h. . . .
 . . . or throws six streams of water.

Jet-powered fireboat

A 240-hp. marine jet engine sucks up water and spews it out of rear nozzles to give this Turbocraft fire and rescue boat a top speed of over 35 m.p.h. The propulsion system can be converted in an instant into a pump to feed six hoses with pressure streams that put 2,500 gallons a minute on a flaming ship or pier. The 20-foot boat sells for \$15,550.



Movie shows in the air

The next time you make a long non-stop flight, the hours in the air may go faster. TWA is installing in-flight movie facilities in first-class cabins of 707 SuperJets flying between New York and California, and transatlantic to London, Paris, Lisbon, and Madrid.

Preview and first-run films will be shown and each seat will have a headset outlet so you'll hear the sound without disturbing other passengers.



Musical typewriter

This weird-looking contraption reproduces sheet music quickly and cheaply for use by choral groups and bands.

Standard keys print the notes while the left hand operates a lever that passes through a quadrant to space them properly on the staff. The inventor is Murray Parker, a production man for the Australian Broadcasting Commission. He claims that he can copy a tune with it about as fast as it can be sung.



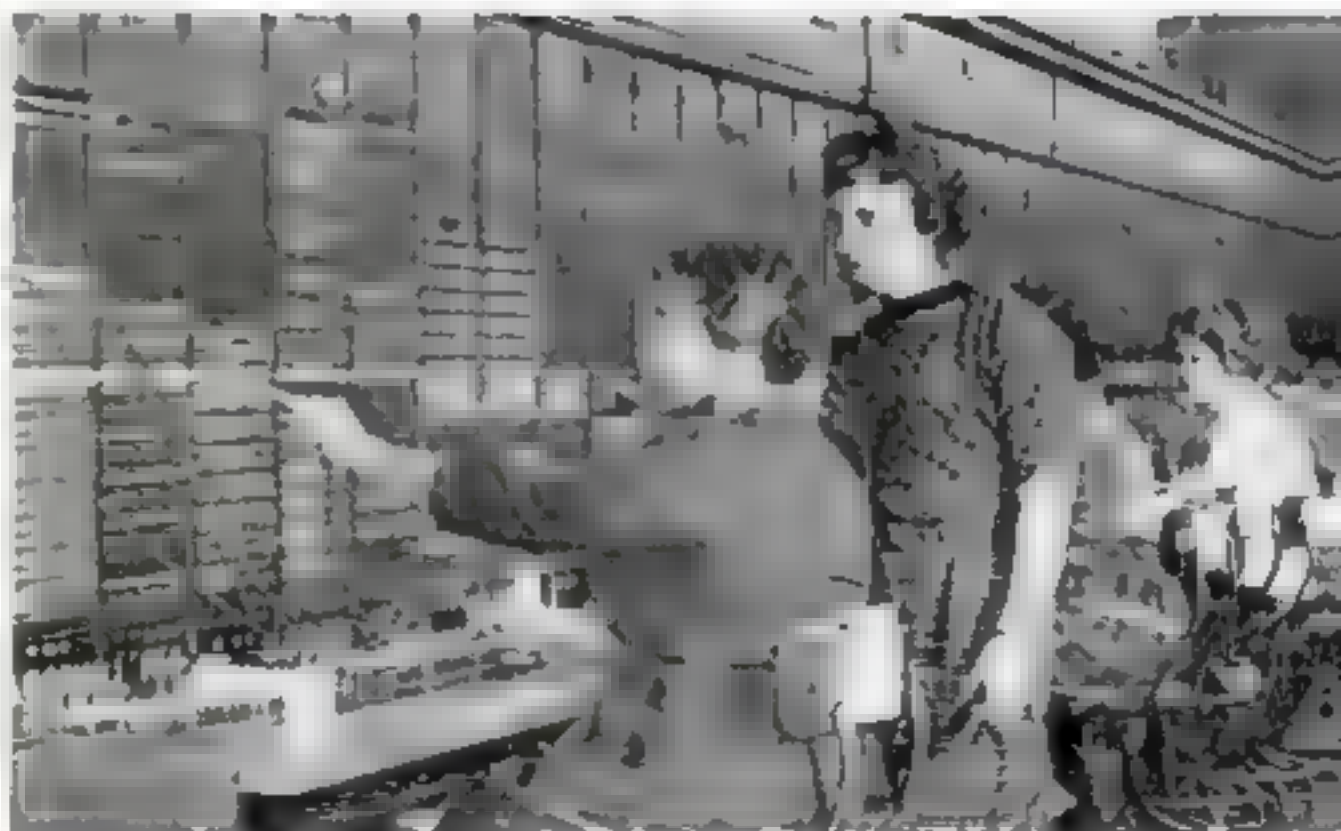
Operator Florence Capney (at board, right) plugged in to hear a child cry. "I'm locked in the closet! Nobody can hear me!"

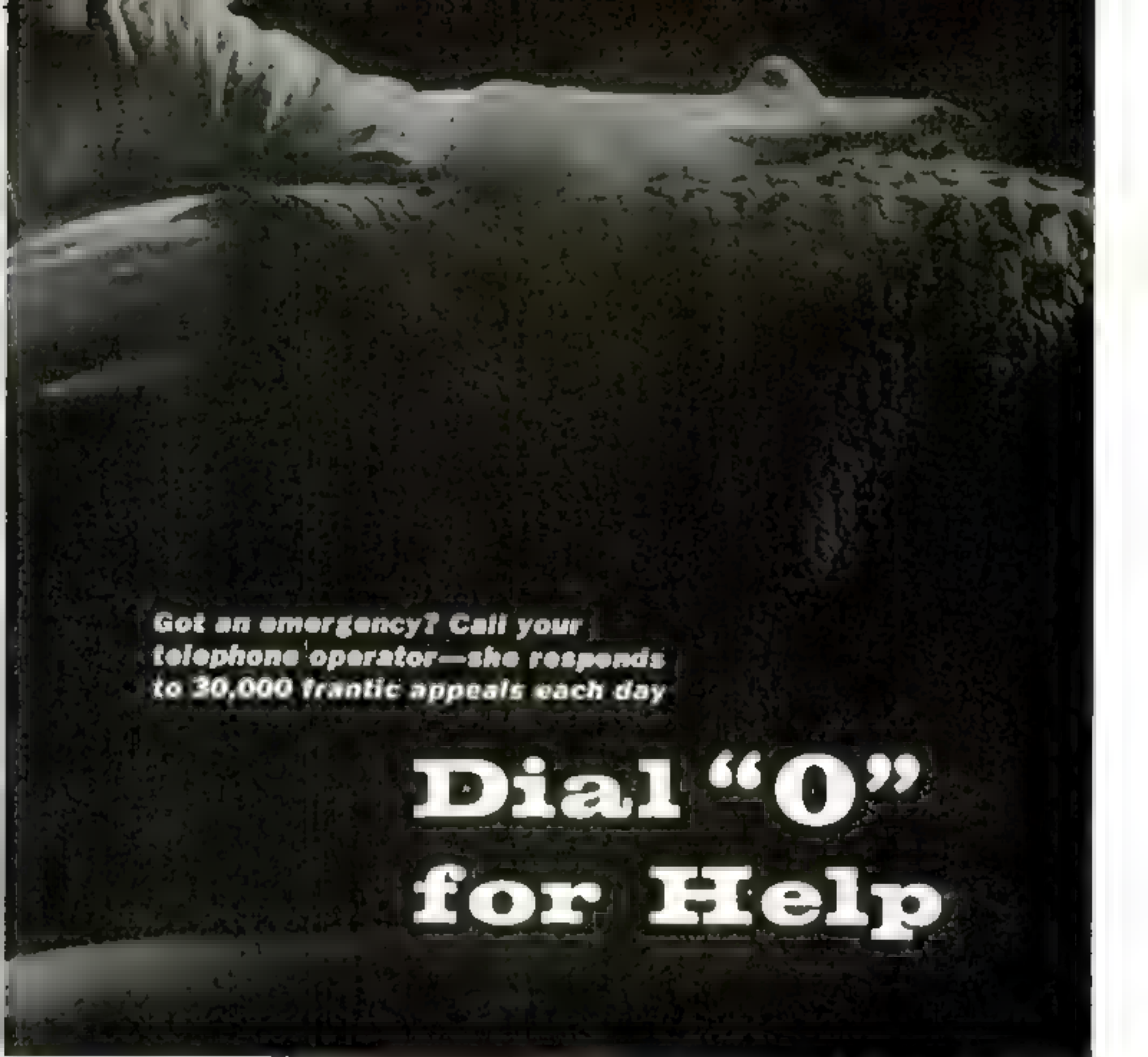
How many telephones have you got in the house?" asked the operator as she summoned her supervisor.

Lots.

"All right, dear," cut in the supervisor, hang up and don't answer the phone when it rings.

A surprised parent who did answer said his daughter had locked herself in a big walk-in closet where an extension had been installed for telephone privacy. The squealing and shouting of a birthday party had drowned her shouts.





**Got an emergency? Call your
telephone operator—she responds
to 30,000 frantic appeals each day**

Dial "O" for Help

PS PHOTOS BY W. W. MORRIS AND R. D. BORST

By Devon Francis

IN PITTSBURGH, one day last June, a rambunctious three-year-old named Billy slammed a basement door on his mother. She was a prisoner. The door's snap lock could be opened only from the upstairs side. The windows were too small for her to squeeze through.

"Billy!" she called. Billy couldn't manipulate the lock.

"Billy!" Slowly she sweet-talked him into going to the telephone, lifting the receiver, and dialing "O" for operator.

All the operator heard was one word: "Mama." That was enough. She traced the call, got the address, notified the

police, and in no time at all Mrs. William Sievers was released. It is not on record whether Billy got his stern tanned for his mischief or his cheek kissed for his obedience.

Mrs. Sievers' son was one of 30,000 persons who dialed "O" for help each day last year. A bigger number because 3,000,000 new telephones will be added this year to the 74,000,000 already in use—will dial "O" for help in 1961.

When an emergency call reaches a rural switchboard, the problem usually is simple. The operator knows everybody. "Martha!" wails a subscriber. "This is Ann! Call the fire department!"

When the call occurs in the bleak, im-

CONTINUED

personal climate of a big city, however, it's something else again. Somebody dials "O," yells "Help!" and hangs up. Or an operator plugs in and hears only a groan. Or a tot telephones, "Mother fell down and won't answer me."

The telephone company is armed for such emergencies. It encourages you to dial "O." There's good reason. If you dial a hospital, or the fire department, or the doctor, you may fail, in your excitement, to transmit the information vital to your getting help. Each day hundreds of persons dial a number, blurt "I've got an emergency!" and hang up.

Because the automatic equipment handling the call is untouched by human hand, the call is lost.

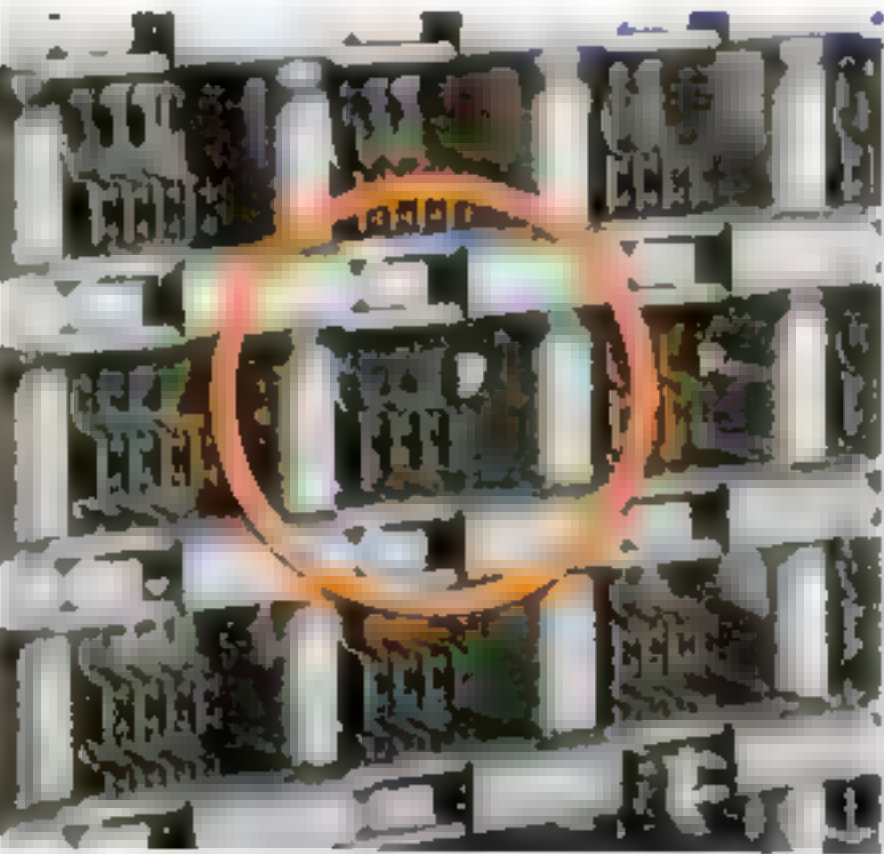
The open channel. But when you dial "O," you open a channel to help that can't be closed even if you hang up the phone. The instant the operator plugs in, she sets in motion a train of emergency procedures that yields your name, address, and telephone number within minutes.

The rest is simple. She alerts an ambulance or a doctor or the police or the fire department.

How she identifies a caller is only seeming legerdemain. There's a system. How it works is described in the drawings on these pages.

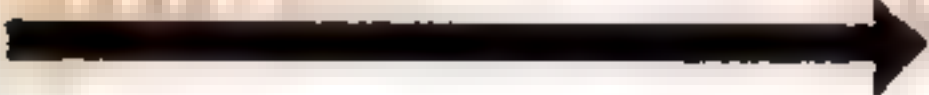
Dialing "O" saves lives, or effects rescues, every day.

(Continued on page 228)



END OF SWITCHMAN'S SEARCH—closed contacts on a vertical column—is shown in circle. Picture shows small section of typical customer routing panel. Your switch is at bottom of column.

On automatic dial telephones,

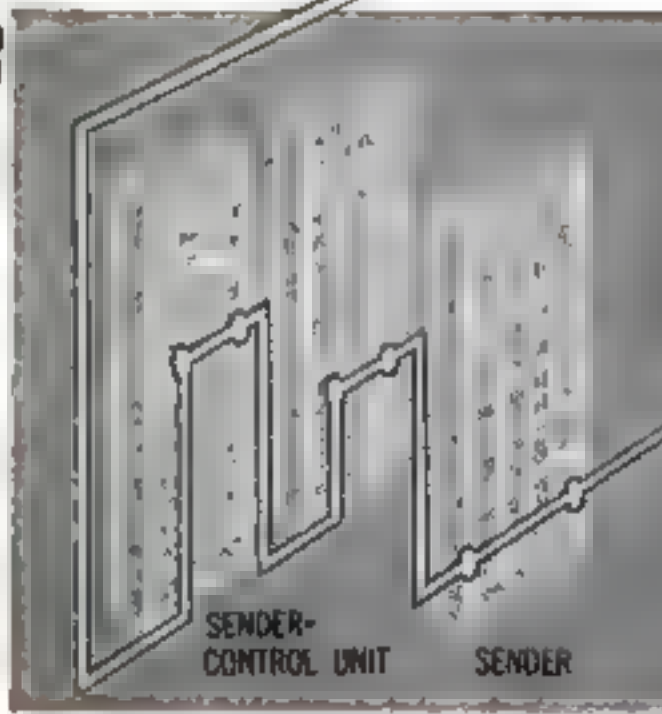


1 PICKING UP your phone connects you to a switch, assigned to you exclusively, on a routing panel. Compare routing a call to a locomotive's finding a path through a railroad yard. Automatically, your call takes one of hundreds of possible paths through the panel's grid, consisting of vertical columns and horizontal rows, to a "sender." You hear a dial tone.

CUSTOMER ROUTING PANELS

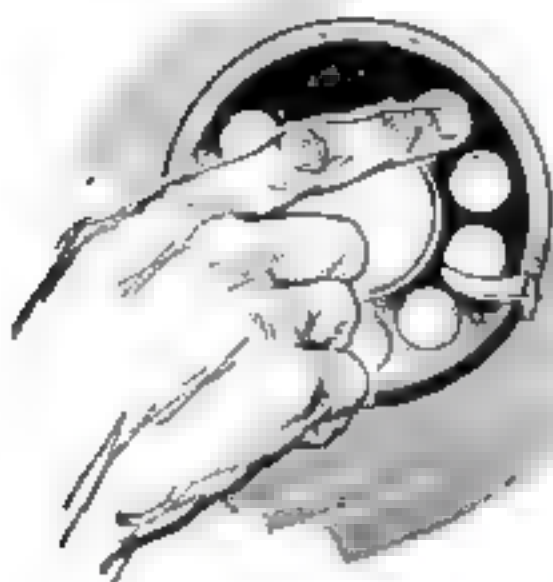


7 AT YOUR SWITCH on this panel, the search ends. Its stenciled code number appears opposite your number in a book. A card index gives name and address.



You are identified



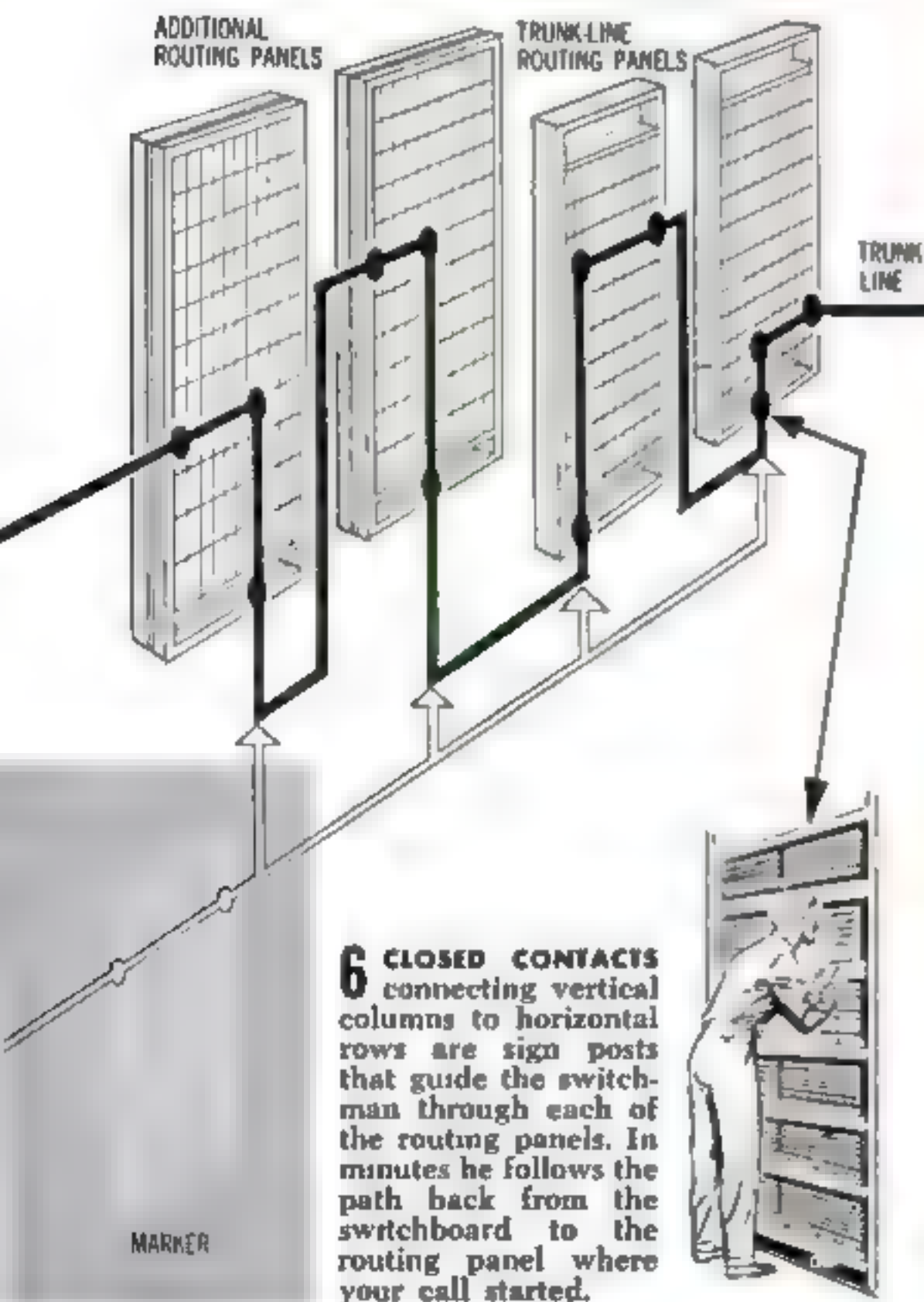


2 IF YOU DIAL "O," the sender—heart, brains, and memory of the dial system—records pulses, generated by the spinning dial. It contacts a "marker," an electric scout. Ten pulses mean that you want an operator. So the marker finds an extension of your path through other panels and a trunk line to a switchboard. Their work done, sender and marker drop out of circuit to serve other calls. The additional panels, like tracks in a railroad yard, boost by hundreds the telephones you can reach.



3 WHEN THE OPERATOR PLUGS INTO THE SWITCHBOARD (in response to a signal light), she introduces an electric current into the circuit that will maintain the path from your phone to her board even if you hang up.

4 IF YOU ARE UNABLE TO TELL THE OPERATOR WHERE YOU ARE, she calls a "switchman" in a maintenance center and asks him to trace the call back from the trunk line on her board. She identifies it by a number over the light on her board.

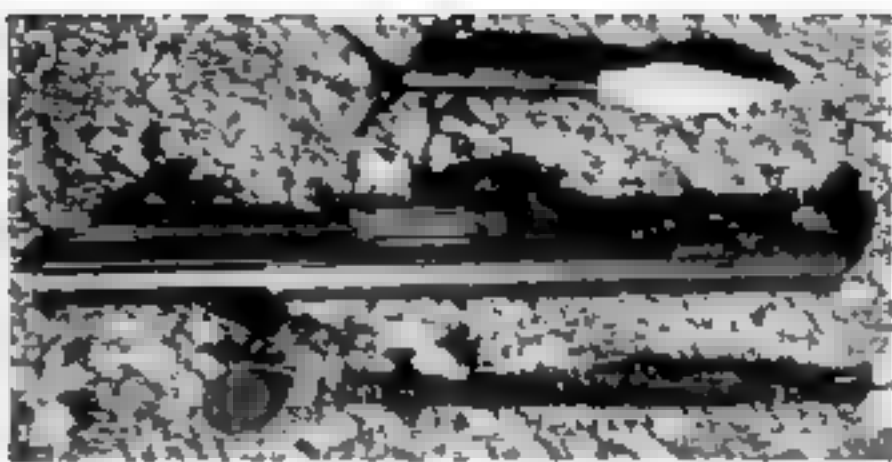


5 THE SWITCHMAN knows where this trunk line emerges from the panel. There's where he starts his search.

by a path of closed relays leading back to your personal switch



ONE-MAN BAZOOKA is aimed like a rifle with aid of front and rear sights. It can be fired from kneeling, standing, or prone positions.



ROCKET GRENADE with super-explosive warhead is at top, disposable carrying case and firing tube at center, canvas sling at bottom.

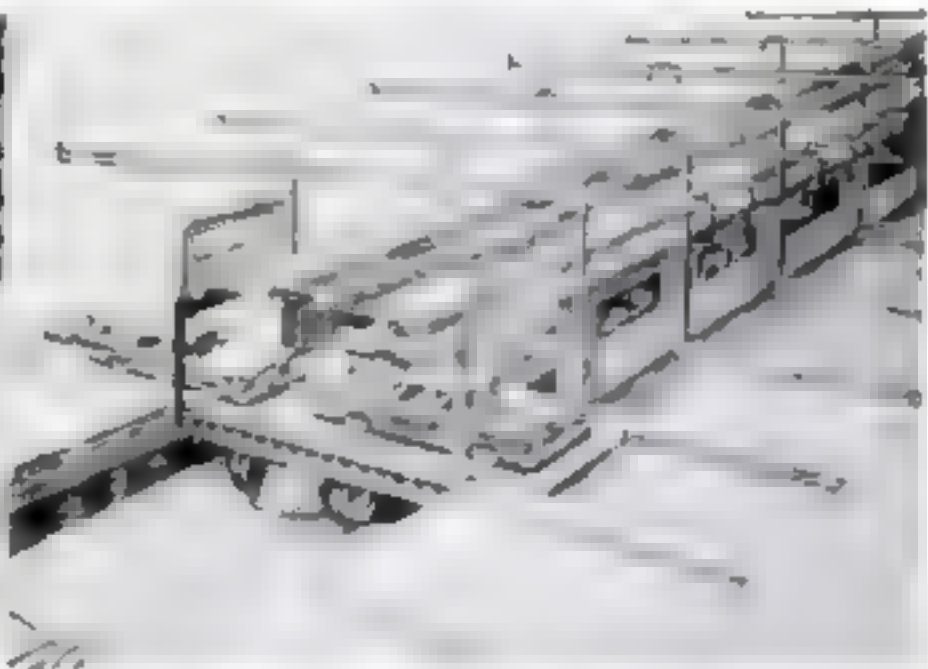
Lightweight bazooka

The Army's newest antitank weapon, the XM-72, is a rocket grenade that can be launched from its own polyester and fiber-glass carrying case. Its charge is a powerful new explosive called octol, effective against tanks, armored vehicles, concrete bunkers, earth-filled log emplacements, and sandbag fortifications.

It weighs $4\frac{1}{2}$ pounds, costs \$30. Four can be carried in a canvas pack over the shoulder like a quiver. The old bazooka it will replace weighed 20 pounds, cost \$175, and required two men to fire.



TRAIN OF CAR-CARRYING CARS would ride at 150 m.p.h. on electrically propelled rollers. Guide rails at sides would keep it in line.



CARS DRIVEN ONTO DOLLIES would be automatically loaded and unloaded in one minute. Panel lights would indicate vacant spaces.

150 m.p.h. on roller highway of the future

Come the 1970s or thereabouts, you may drive your car onto a loading platform at your station, be placed with it on a roller coaster, and be whisked at 150 m.p.h. to your job in the city or to a distant destination. That's the prediction of Westinghouse engineers who have conceived a "roller road" to replace toll highways when they become overcrowded with America's expected 100,000,000 cars.

The new road would consist of sets of rollers, spun by individual motors and

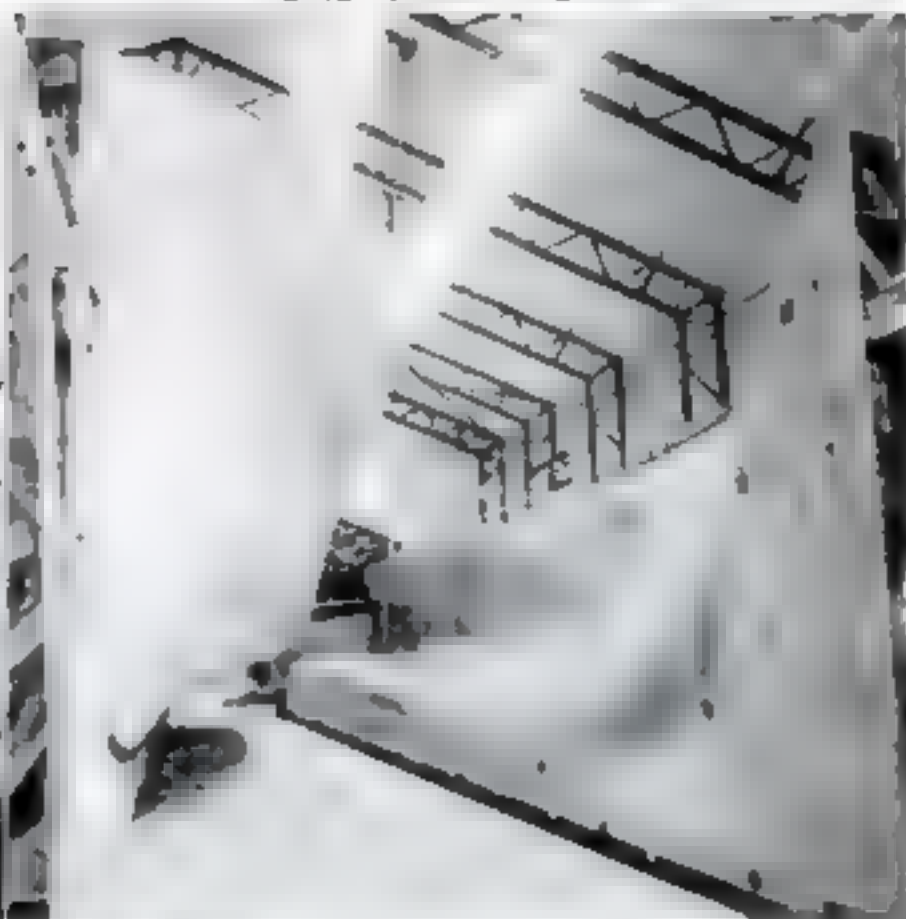
spaced 20 feet apart. On it would run trains of three to ten flat-bottom cars held in place by horizontal wheels riding on guide rails at the sides. Each would accommodate ten automobiles, loaded and unloaded automatically at stations on dollies. A lounge car would provide relaxation for drivers going long distances. Starting, stopping, loading, unloading, and emergency braking would be controlled by computers. The trains might also transport commuters without cars.



FIBER-GLASS HULL of Ocean Commander is swung aboard liner for delivery in this country.

Largest one-piece hull

This gleaming-white fiber-glass yacht hull was molded in one piece in England and shipped across the Atlantic for fitting and the installation of two 250-hp. diesels in a Maine shipyard. It is 67 feet long, has a 16 $\frac{1}{2}$ -foot beam and 4 $\frac{1}{4}$ -foot draft—largest job of the kind yet undertaken. The mold, a ply and veneer skin on timber framework, was built in three sections



PORT SIDE of mold is taken from hull. Other pieces formed the starboard side and transom.

for easy removal of the 11,500-lb. hull. The yacht was designed by John G. Alden & Co., U. S. naval architects, with sweeping lines and a clipper stem, similar to those of Coast Guard cutters noted for seaworthiness in heavy weather.

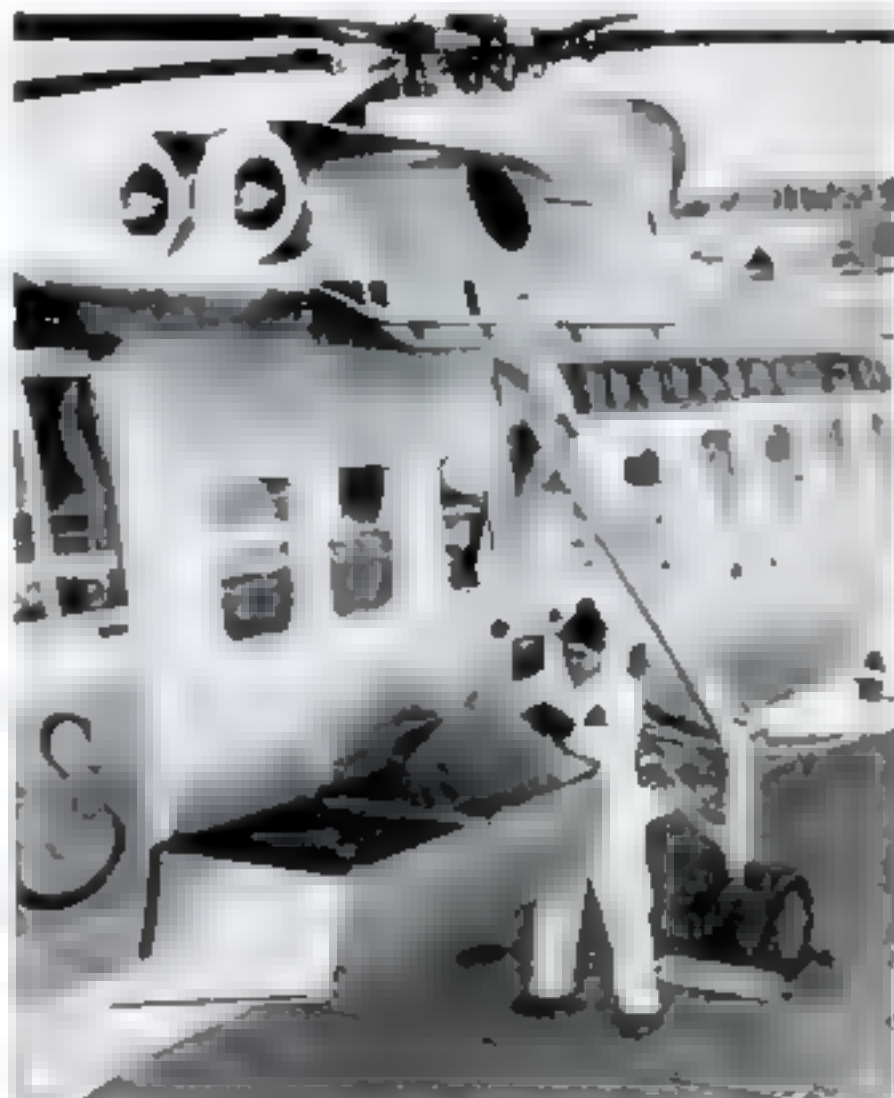
It will cost Virgil Browne of Oklahoma City some \$196,000 when completed. Halmatic Ltd., of Portsmouth, charged \$28,000 for molding the hull and another \$14,000 for building the mold.



TWIN TURBINES drive rotor to give helicopter extra speed. Arrow points to baggage pod.

Bottom-drawer loading

A removable baggage pod aft of the cockpit on a new 28-passenger turbocopter can be slid out like a drawer, set on a wheeled carriage, and loaded or unloaded in the terminal. It holds 1,200 pounds, about 25 suitcases. The new twin-turbine Sikorsky S-61L goes into service this fall between airports and downtown Los Angeles and Chicago. It has a cruising speed of 136 m.p.h., a range of 350 miles.



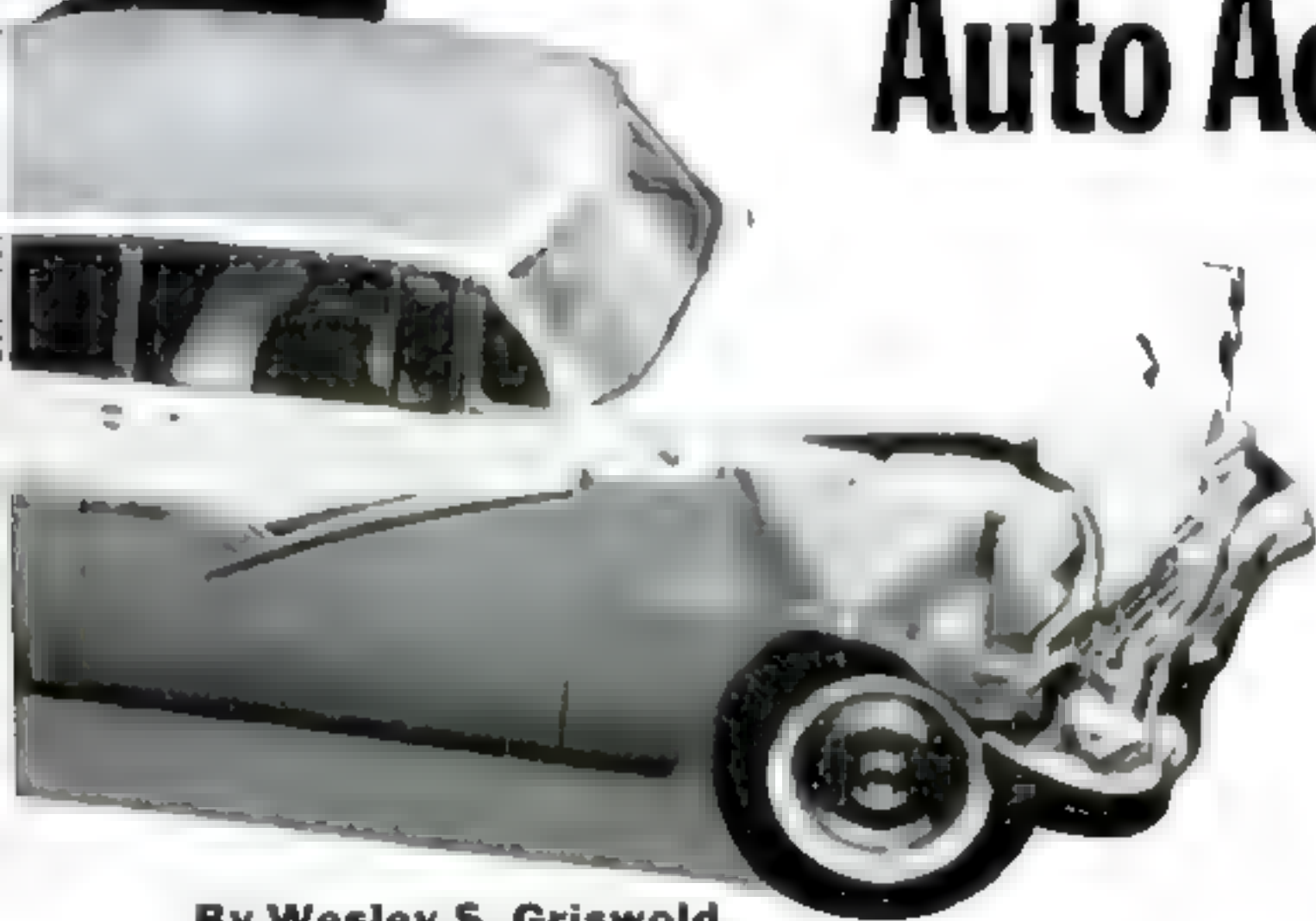
DRAWER-LIKE POD can be loaded on the field or trundled between baggage room and copter.

***In five terrifying minutes
one Thanksgiving
morning, 34 cars
were smashed—some
of them over and over.
The biggest surprise: Miraculously,
no one was killed***





The World's Biggest Auto Accident



WHEN THE FOG LIFTED, seven lightly damaged cars had already left the scene, and tow cars were fast removing the rest. This tight pile-up, however, still blocked the northbound lanes. Most of the 33 injured people were hurt by being hurled against fixed metal objects. Twenty-four cars suffered major damage in the massive road entanglement.

By Wesley S. Griswold

WHEN the highway patrolmen got there, they could hardly believe their eyes. Through the fog that was gradually lifting, they saw crazily crumpled cars strewn across all six lanes of California freeway and as far down the road as visibility extended.

It looked as if an auto junk yard had

suddenly been dropped from the sky. One young officer felt shaky. "I just wanted to pin my badge to the seat and go home," he said later.

It was Thanksgiving Day, 1958. What had just happened was probably—in size and in slow-motion duration—the biggest automobile accident in history. Thirty-

CONTINUED



Southbound lanes were left till last in the order of clean-up, while holiday traffic was routed

four cars were involved. Thirty-five people were hurt. Twenty-eight of the injured were taken to hospitals, in a platoon of ambulances that had to make repeated trips to collect them all.

In the blind, bewildering minutes during which the fantastic pile-up was taking place in dense fog, thousands of dollars' damage was done to the entangled vehicles. Nobody has ever figured out how much it cost to repair the severely injured people who were in them.

A lazy chain reaction. "It was a miracle that nobody was killed," said one officer on the scene. "Not one driver admitted he had been going more than 45 miles an hour. It must have been the truth. Otherwise, there would have been an unholy slaughter."

"I've never seen such fog," said a slim, pretty schoolteacher who had become trapped in the massive collision. "I felt as if I were driving with a paper bag over my head."

Ironically, the crash took place on a brand-new section of freeway. It occurred south of the city of Vallejo, at the northeastern edge of San Francisco Bay. At a ribbon-cutting ceremony two days before, the twin bridges over Carquinez Strait and their spotless six-lane approaches had been hailed as eliminating a major bottleneck. Now, 43 hours later, traffic was thoroughly bottled by as grim a stopper as fate ever devised.

After long investigation, officers of the California Highway Patrol discovered something even more ironic. The nearly simultaneous pile-ups on opposite sides of the freeway had been caused by foolhardy drivers who had promptly fled the scene.

When the fog lifted and the hail of broken glass was being swept into roadside heaps, neither they nor their cars were to be found. But the testimony of

other drivers made it clear that those who had caused the collisions had not suffered a dent or bruise themselves. The culprits, hearing the whamming and banging begin behind them, had coldbloodedly driven off.

Appointment for an accident. Early on that morning of Nov. 27, fog lay languidly across San Francisco Bay and explored its estuaries. One puffy finger poked into Carquinez Strait.

Inland, the young day was crisp and bright. Motorists headed northward had been driving mostly in sunshine. They had run through a few patches of fog, but these had not been troublesome. Because it was a holiday morning, traffic was unusually light, with the cars well strung out.

A few minutes before eight o'clock, an unknown driver on the northbound side of the broad new road swung into the long downhill stretch where the freeway dips toward the Carquinez bridges through a big cut. He saw a white mist in his path. He must have assumed it was no worse than he had already met, and he made no effort to check his speed.

In an instant, he realized his mistake. This fog was so dense he could barely see beyond the hood. He braked hard and hurriedly turned on his lights. His car crawled forward—and kept on going while calamity moved in behind it.

The sudden glow of his tail lights, directly ahead and far too close, warned the driver following. He stamped his brake pedal so vigorously that his car, with tires braying, slid to a stop.

For a few seconds, the second car was motionless, while its driver gulped for composure.

That was when disaster shifted into high.

The stopped car was struck savagely from behind as each of the next four



around this whole section of freeway. Here, the northbound lanes have all been cleared.

automobiles plowed heavily into the one ahead of it.

The driver of the fifth car vaguely saw the pile-up in time to make a desperate swerve left to avoid it.

He dodged one crash but ran into another. His car lurched over the concrete divider and landed in the path of two southbound vehicles. The first hit the nose of his car broadside. The second rammed the hind end of the first.

Meanwhile, eight more cars had careened into the sprawl that lay across the northbound lanes, like football players needlessly hurling themselves upon a downed ball-carrier.

The sound and the fury. "It sounded as if somebody were dumping a huge truckload of garbage pails," recalled the pretty schoolteacher, whose name, for the purposes of this account, will be

[Continued on page 230]

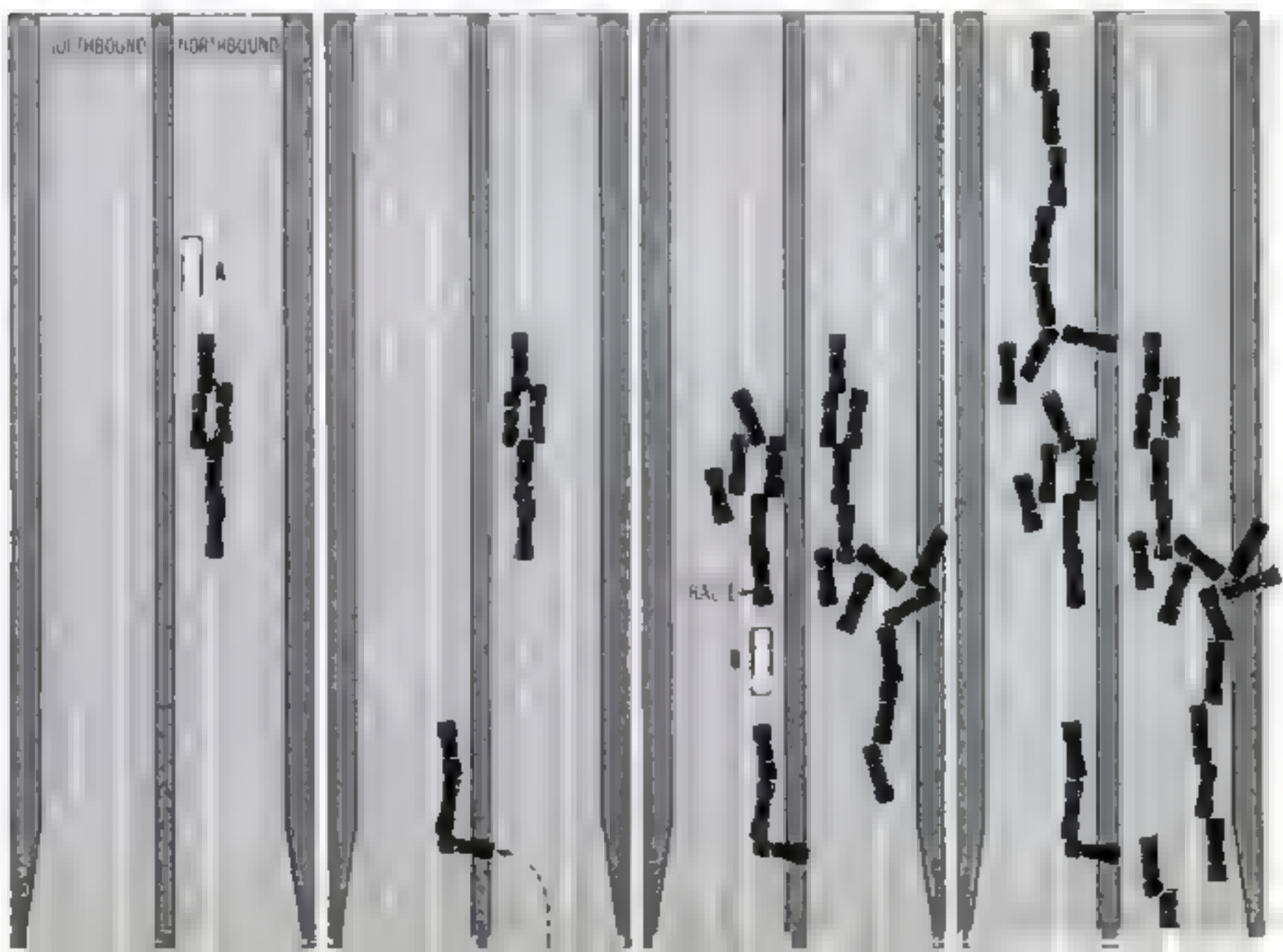
How Thanksgiving Day crash developed on fog-shrouded freeway

It all started when an unknown driver (northbound, car A) ran into dense fog. He braked hard, then crawled forward—and kept going. But car behind had had to stop suddenly. Next four cars hit him.

Next northbound driver, seeing pile-up ahead, swerved sharply to the left. His car lurched across divider and landed in path of two southbound cars. The first car hit him broadside; second car rammed into first.

Eight more cars piled noisily into the sprawl across northbound lanes. Man in car B, southbound, stopped, got out and walked off—apparently to investigate. His vehicle blocked Gracie, triggered new crashes.

When police arrived, this is what they found—34 vehicles scattered helter-skelter across freeway. Two hours later, tangle was cleared, and holiday traffic was moving normally. Fog had now vanished.





Purpose in this porpoise

The porpoise breaking water above is the subject of research by scientists at the U. S. Naval Ordnance Test Station in California. This photo, used for water-exit and -entry evaluation, was taken by a high-speed camera that stopped motion at 1/3,000 second. In other torpedo and underwater-ordnance tests, Notty (named from the first three initials of the station) has been trained to wear plastic rings and rubber suction cups, swim through hoops and around sunken obstacles, dash at full speed ahead, and come to crash stops.



Turning scrap into a reef

Junked automobiles, refrigerators, and other large scrap is dumped overboard here to make an offshore fishing reef between Wrightsville and Carolina beaches in North Carolina. The scrap was loaded on a barge, the pieces chained together, and an anchor attached at one end. With the anchor thrown overboard, a tug simply pulls the barge from under its load.



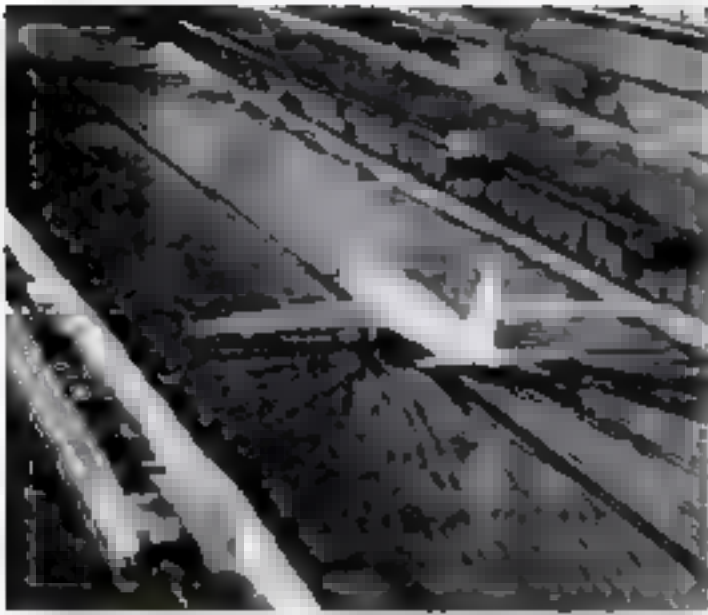
Baby scooter is easy to ride . . .



. . . or to stow in a car trunk.

Pint-size scooter

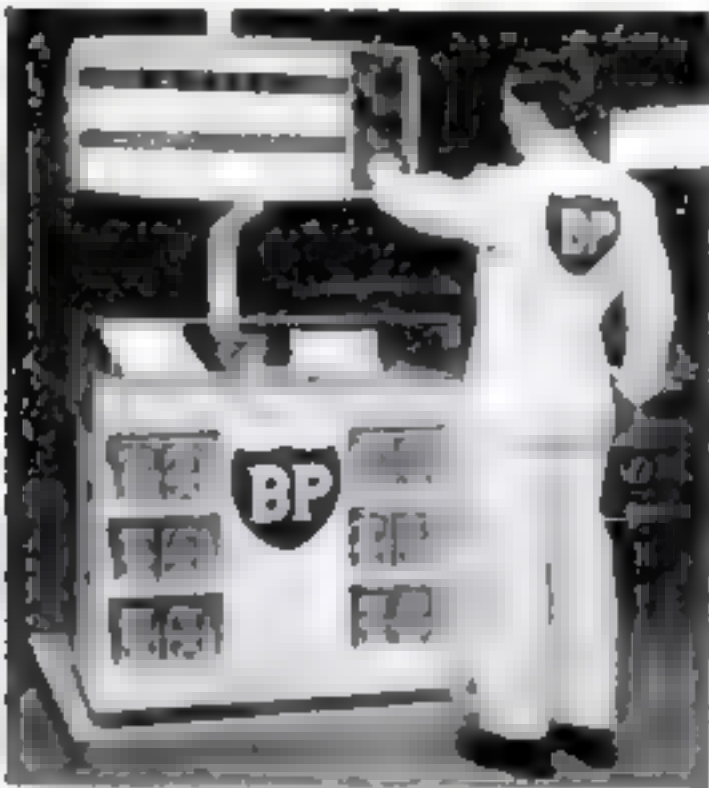
This 60-pound British scooter can fit in a car trunk or be carried in a small boat for use as a wheeled tender. Only two feet high and a yard long, it's powered by a tiny two-cycle engine that does 140 miles on a gallon of gas with a top speed of 30 m.p.h. There is no gearbox, and driving is further eased by a centrifugal clutch. The only speed control is the twist-grip throttle on the handlebar.



Water brake for jets

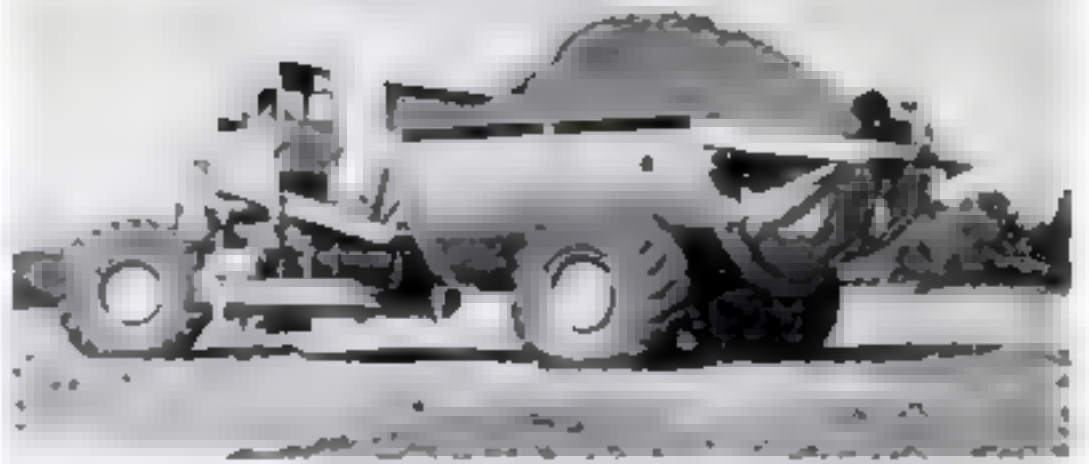
This scale-model Boeing 707 jet airliner comes to a stop on a pool of water covered by a sheet of plastic film. Similar plastic-covered ponds, 1,000 feet long, at the end of runways would be used to stop overrunning full-size jet planes.

The deceleration experiment shown here was conducted at the National Aeronautics and Space Administration's research center, Langley Field, Va., with full values simulated at .043 scale.



Multi-fuel pump

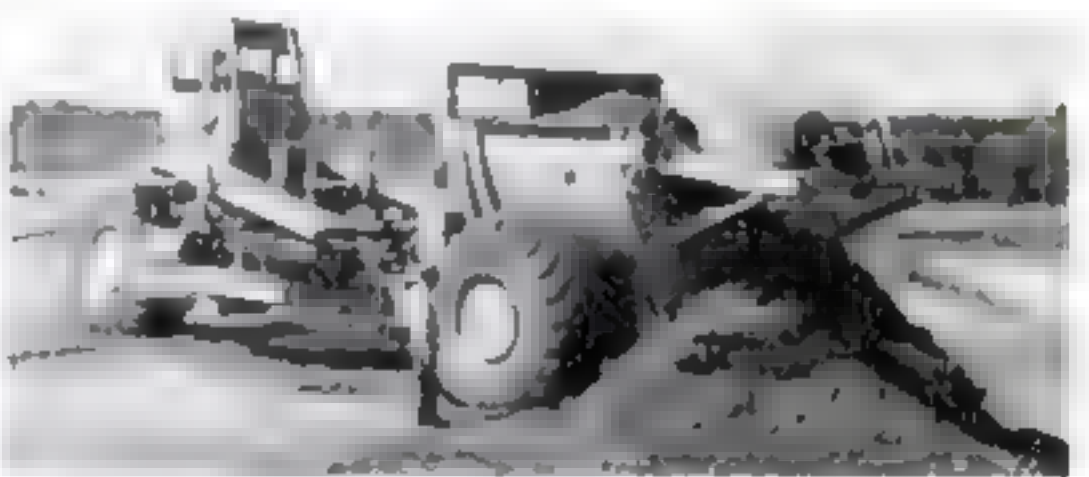
Versatile pumps now deliver diesel fuel and gas-oil lawn-mower mixtures as well as pre-selected octane blends at one-pump service stations in England. The desired grade and quantity are dialed. Removal of the hose nozzle from its boom sets the valves and starts the appropriate pump. Control is based on two trains of electric pulses generated by photocells that scan the spindle of the pump's meter.



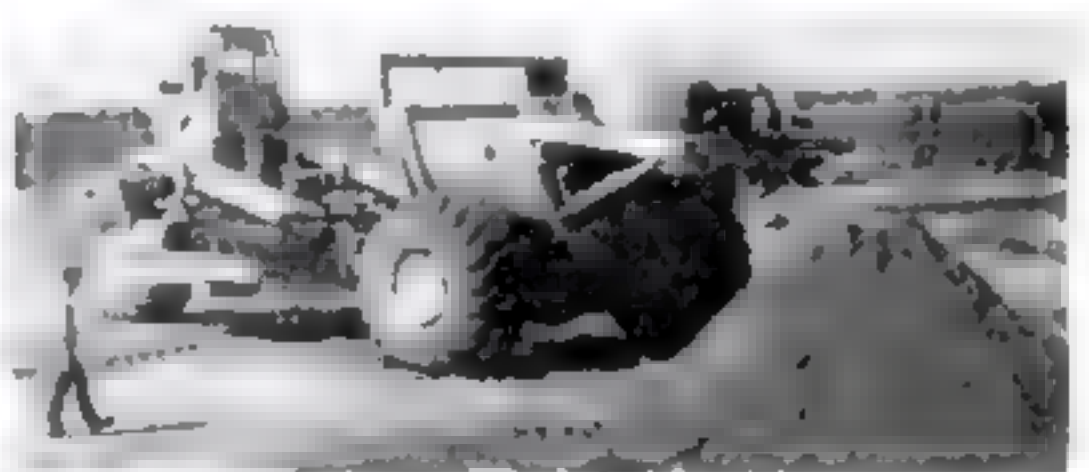
1. Loaded truck backs to dumping site.



2. Clamshell opens and first load goes.



3. Front bucket telescopes into the rear.



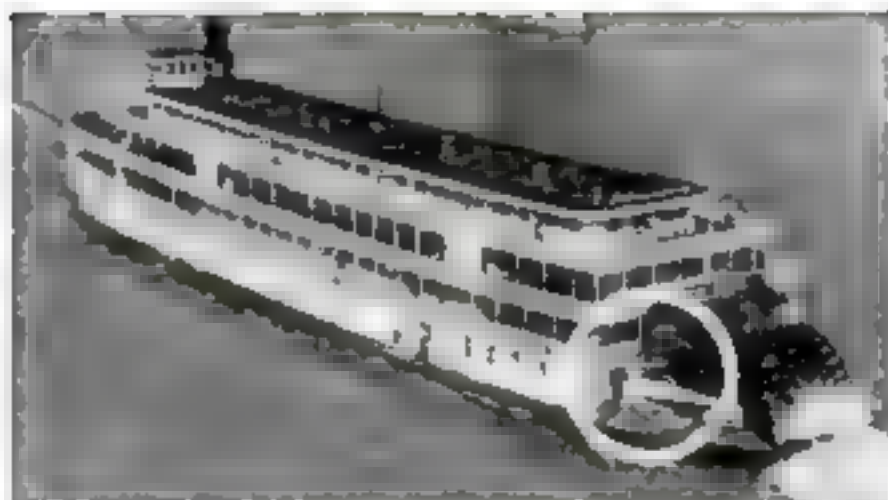
4. Moving tailgate pushes out rest of load.

Triple-action dump truck

This earth-mover dumps its 60-ton load in three stages without raising its body. The rear part is sent spilling out when a clamshell at the back is raised, the second when the forward bowl is power-telescoped into the midsection, and the last when a movable tailgate—riding on a fixed gear track—pushes out to the rear. R. G. LeTourneau, Longview, Tex., makes it.



DELTA QUEEN'S SKIPPER, Capt. Paul H. Underwood, looks over his shipboard mint crop.



THAT SHE GROWS, in the center of the circle, under the spray by the side of the stern wheel.

Juleps on the Mississippi

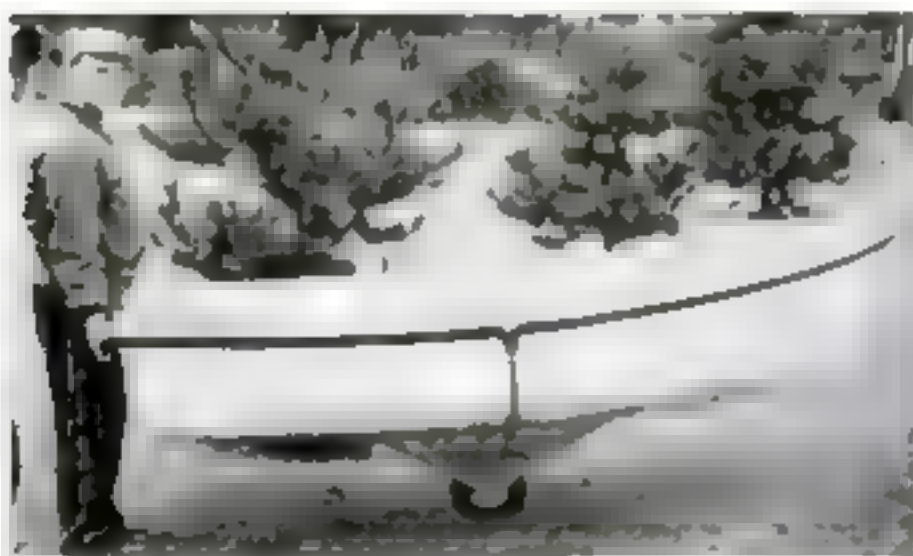
The stern-wheeler Delta Queen, plying the Mississippi, Ohio, and Cumberland rivers, has flower boxes just below its main deck on either side of the wheel. They are planted with mint—for passengers' refreshments—which is kept growing and fresh from the wheel's spray.

One of the few paddle-wheelers now in service, the Delta Queen was built in Scotland in 1926, shipped dismantled to San Francisco Bay, and sailed under her own steam to the Mississippi after the war. The Queen's home port is Cincinnati.



Electronic "police" wagon

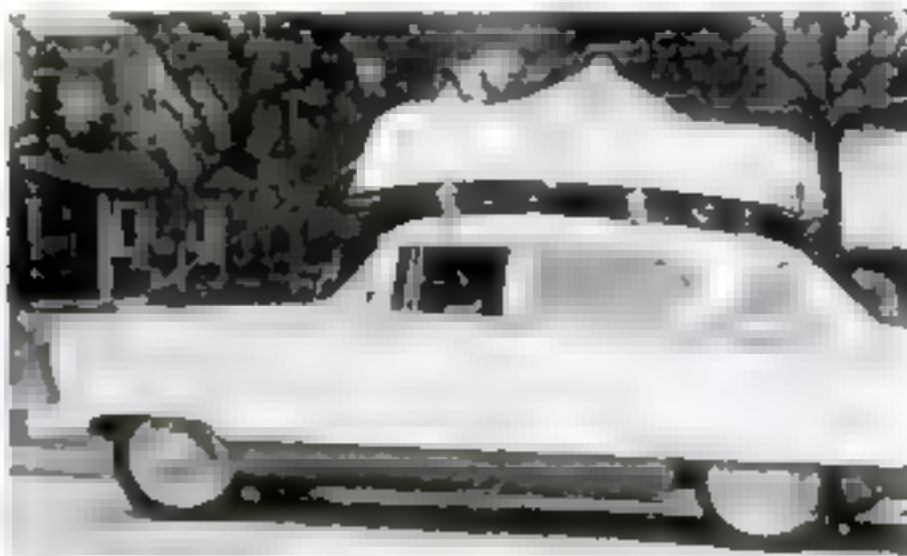
This odd-looking truck polices the air waves over Eglin Air Force Base in Florida. Called a Frequency Monitoring and Interference Control chase vehicle, it locates stray air signals that interfere with radio missile control and drone operations, and warns off the senders—usually welders, jet-starting power carts, and faulty automobile-ignition systems.



FINGER TRIGGER at stern controls brake when boat is being maneuvered down steep grade.

Free-wheeling boat mount

A single wheel strapped to the bottom of a car-top boat lets you push it to the water when you have reached the end of the road—and carry your fishing or hunt-



WHEEL MOUNT need not be dismantled when boat is on car. Just turn boat upside down.

ing gear in it instead of making a second trip to the car. It's equipped with a brake, finger-operated from the stern, for use when descending a river bank or other steep grade. Trail Wheel is made by Ben A. Barker, Seattle, Wash.



Ticklishness Is No Laughing Matter

Scientific "tickle tests" show that this supposedly playful response is closely bound up with our instinct for survival

By George J. Barmann

OF ALL human sensations the most curious and puzzling is tickling. You can tickle someone until he laughs so hard he begs you to stop. You can tickle him sometimes until he cries. In certain cases, authorities report, a person can even be tickled to death.

That playful probing about the ribs is usually meant as a pleasant, harmless jest. But tickling is being recognized now as a more complex and serious phenomenon, bound up with our instincts and emotions and with the anxieties of our ancestors.

Charles Darwin and others studied ticklishness in the last century. Darwin discovered that young chimpanzees chuckled when he touched them under the arms. Present-day investigators are delving deeper into the subject, trying to learn exactly why we react as we do.

These experts assert that tickling is more than a laughing matter. In fact, one of the first things they observed is that



Tickle him under the arm and a chimp will laugh . . . so Darwin found out.

CONTINUED

it *never begins as a laughing matter*: When they tested babies a few days old, they discovered that the earliest response was a generalized annoyance or irritation. The giggle we associate with tickling doesn't show up until a child is about four years old. After that most of us experience the sensation in some places on the body during most of our lives.

Calling the spots. The most ticklish place is probably the ribs, especially where they join the abdomen. But that's



"Cootchy coo," you say, poking with a finger to make baby smile. Truth is, newborn babes don't react at all—ones a few days old only get annoyed if tickled.



"Learn some control," advised a columnist for the lovelorn when an emotional gal wailed she giggled when her boy friend kissed her. His mustache tickled.

not the area we react to earliest. An 11-day-old baby gets annoyed if you stroke the region between his nose and mouth—but apparently doesn't tingle elsewhere. The reason, scientists say, is that nerve endings in other parts aren't as well developed as in the nose-mouth area. But as a baby grows, so does his susceptibility to tickling. The main ticklish points that later develop—forehead, neck and

throat, ears, armpits, palms, soles of feet—reflect this gradual spreading out of nerve sensitivity. Scientists won't give any one of these areas priority. It varies from person to person.

A 55-year-old bald-headed drug salesman told his physician in Shreveport, La., that anything as light as a thread grazing the top of his head would drive him crazy. A dentist in Phoenix calls his drill the "tickler" when he has young patients in the chair. The vibration of the drill often causes a sensation in connecting nerves that makes the nose tingle.

The team of scientists that has begun to study ticklishness seriously is headed by a psychiatrist, Dr. Joseph Kepecs of the Michael Reese Hospital Medical Center in Chicago. It includes a dermatologist, Dr. Milton Robin, and a psychologist, Mrs. Clare Munro.

They began with a two-minute experiment: lightly stroking the forehead with a piece of pointed cotton wool. They tested people of all ages, from newborn babies to grandparents.

Knoyed by age. One not-too-surprising conclusion they reached was that we grow less ticklish as we grow older. What was not so obvious were these three distinct reaction stages:

1) From nothing to annoyance: "It may surprise doting relatives, but newborn babies are not ticklish at all," says Dr. Kepecs. From about 11 days to about six months they get excited and irritated but don't know why. They haven't localized the source of their troubles—and they haven't learned to scratch yet.

2) Withdrawal: From about six months to four years, infants notice the stroking and are still annoyed but tend to ignore it. This denial has startling effects: Where before he was generally agitated, the infant now gets sleepy. This is still a generalized response but of a different order: It's an attempt to dismiss the problem by pretending it doesn't exist, by withdrawing to the safe world of sleep.

3) Gradual adaptation: From about age four on, a child

reacts to a tickle by laughing and actively rubbing or scratching. Normally this is the point where he learns to localize the trouble and do something about it. The mature reaction—adaptation—where the stimulus first feels like a tickle but ends just as a touch, begins developing.

But there are variations. Some extremely ticklish adults never seem able to control their feelings even if they want to. They jump and chuckle the moment they're touched—sometimes with embarrassing results. There's a girl in Buffalo who confided to an advice-to-the-lovelorn columnist that her romance was in danger. "Every time he kisses me goodnight, his mustache tickles so much I just can't stop laughing." "Learn some control," the columnist answered, "if he won't shed the bristles." Dr. Robin describes such persons as emotional, without much stability.

Some persons overcontrol. At the other end of the spectrum is the individual who resists the sensation, steeling himself against it, or behaving indifferently. The first touch stimulates him, but after that he feels nothing but the slight pressure of touch.

In Cleveland, an advertising artist had a favorite and maddening trick. He'd wait for a colleague to take coffee, then run a soft long-haired brush along the man's neck, and watch him splutter. In revenge, two co-workers sneaked up behind him one day while he was doing a difficult hurry-up illustration. They twirled two of his brushes around his ears. He kept right on drawing, never breaking a line.

Psychiatrists call this reaction "overcontrol"—a word that extends to a person's overall responses to emotional situations as well as physical stimuli.

You, your skin, and Freud.

The inference is that your personality is linked to the way your skin reacts. Physiologically, this may be due to the fact that the nervous system develops from the ectoderm—the outer layer (skin) of the developing human embryo. In Freud's theories both the ego (the rational ruling self) and the id (the mass of life tendencies that gives rise to ego and other forces that make you what you are) also develop from this same ectoderm. Most psychologists, Freudians or not, agree that the skin is a prime stimulus for many drives—in particular, the sex drive.

Male vs. female. Contrary to popular thought, women aren't any more ticklish than men. A girl's date may feel superior when he squeezes her in the ribs and she laughs and twists away. But Dr. Kepecs says that men are every bit as susceptible. To make certain that the results of their tickling tests would not be lopsided, Mrs. Munro included men as well as women in the experiments. She found that the

[Continued on page 242]



Revenge failed: Two artists tried to turn the tables on a teaming office mate. They tickled his ears to make him ruin a sketch. No go: He was overcontrolled.



Is ticklishness a form of self-defense? Maybe our palms and soles are sensitive because our crawling cavemen ancestors could be warned that way.



Tree-point landing

The birdman here, perhaps taking his title literally, alighted in a tree in Peoria, Ill. He was trying to land in a nearby park after his engine had failed. He came out uninjured, reached the ground safely by climbing down the tree trunk.



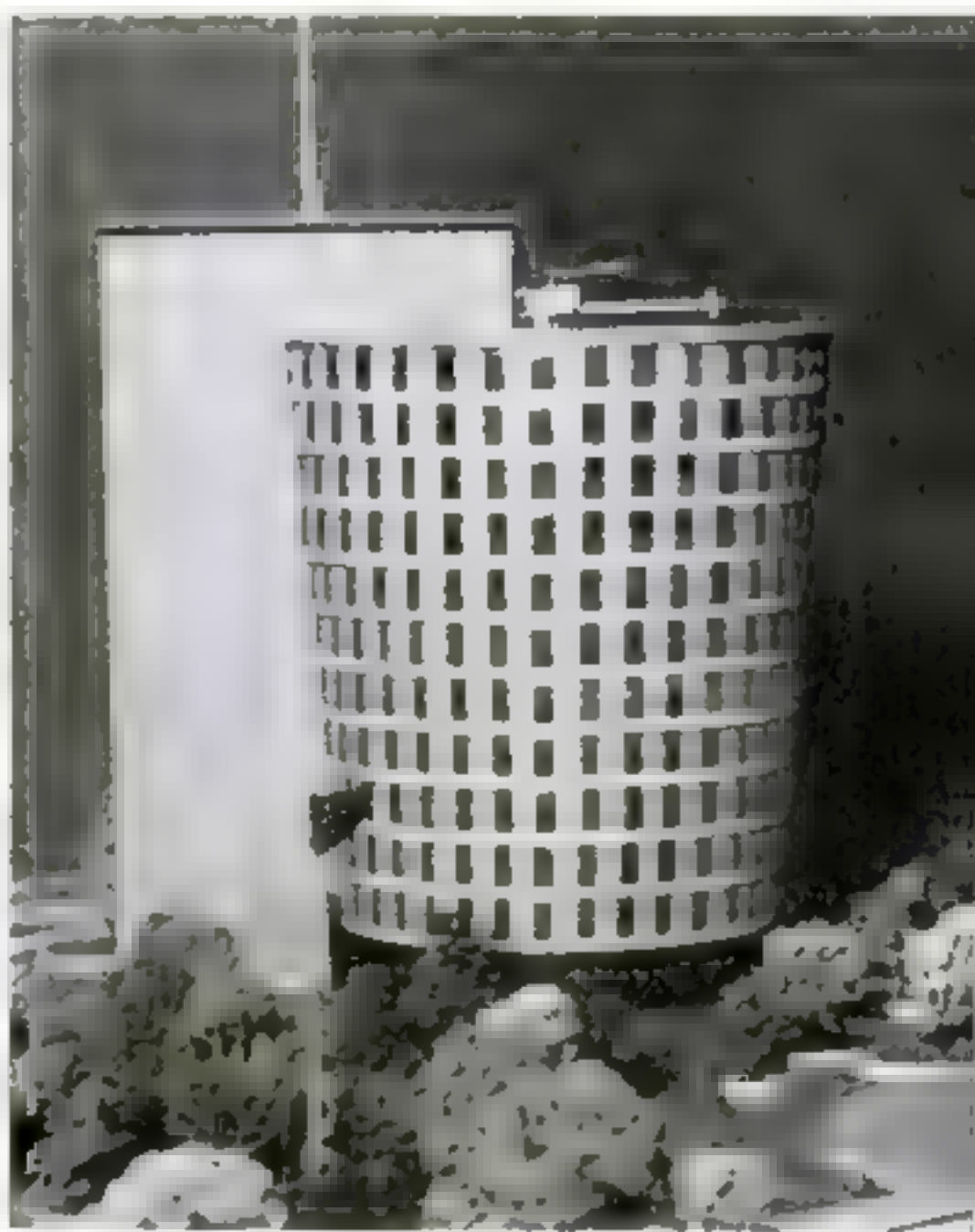
Four-door truck cab

This Ford pickup has a cab built like a four-door sedan. It's one of eight used in taxi service for Marines at Quantico, Va., and holds 12 passengers. They replace the base's conventional pickups.



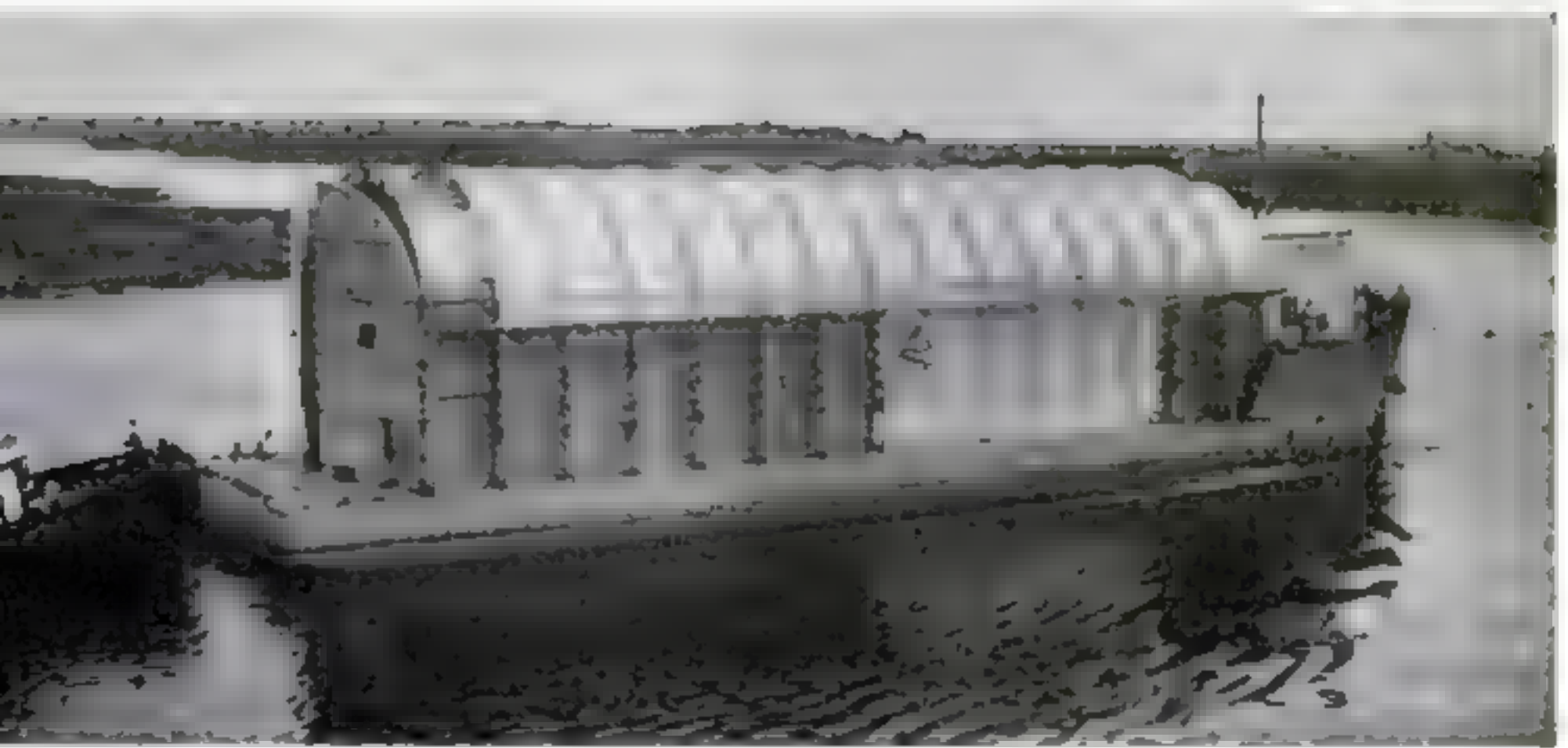
Sports station wagon

Lines of this wagon, based on the British Tornado sports car, are intended to attract the outdoor type. The body is plastic on a welded tubular chassis. Optional power units are Ford Anglia, Consul, or Triumph TR3, the latter giving 100-m.p.h. performance. The Sportbrake will seat four people with room behind for hunting and fishing gear or a big dog.



Geometric school

An inverted truncated cone and a rectangular parallelepiped form the main buildings of this school designed for big cities by C. William Brubaker, Chicago architect. The 11-story cone would house classrooms; the conventional rear building, elevators, stairs, ducts, and plumbing. The design is a spacesaver, eliminating the need for large, expensive plots of land in overcrowded areas.



Water boost for space booster

This huge barge, 180 feet long, 38 wide, was built to transport Saturn missile first-stage boosters from Marshall Space Flight Center, Huntsville, Ala., to the Cape Canaveral launching site.

The 82-foot-long boosters are too big to go by air, rail, or highway. They will travel on the Tennessee, Ohio, and Mississippi rivers; the Gulf of Mexico; and

then through the Okeechobee Waterway or around the tip of Florida.

The barge has a ship's prow and the flat stern of a river barge. It was built at Todd Shipyards in Houston, Tex., to Army design and named the Palaemon for a Greek god of sailors. The booster, first of 10 being built at Huntsville, gets its first test this year.



INTAKE AND EXHAUST extend from starboard side of Navy's "insect life" Super Constellation.

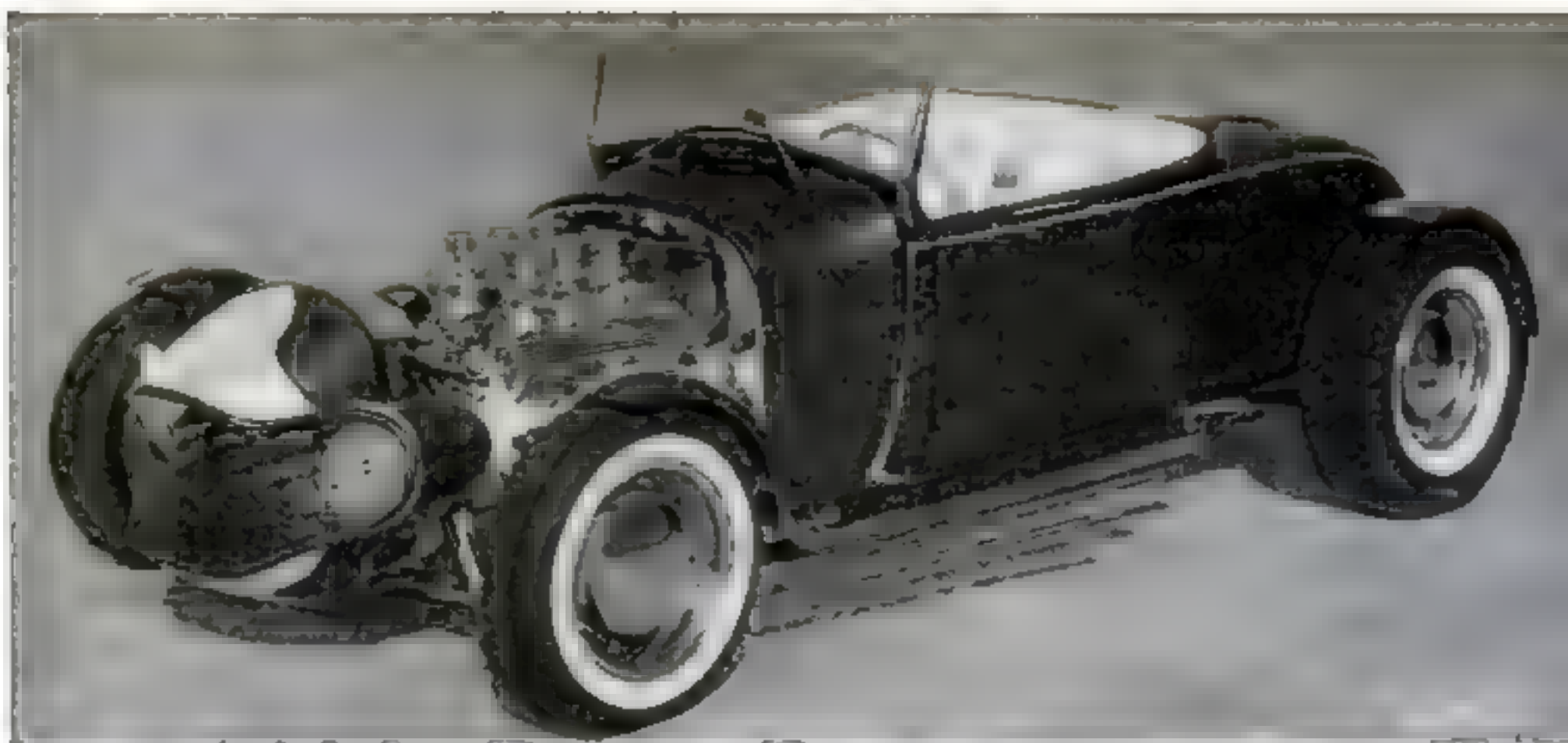
TUNNEL IS WIDENED inside plane to slow down rush of air, avoid crushing trapped specimens.



Netting insects in rivers of air

To check a theory that insects and plant life are transplanted to Pacific islands by intercontinental rivers of air, this Navy R7V Super Constellation will cruise between New Zealand and Antarctica, straining the atmosphere for specimens of life. Air will be filtered in a

16-foot tunnel in the plane's side. To cut air velocity from its initial 340 m.p.h., and bring the specimens to a gentle (23-m.p.h.) landing, the tunnel widens from four inches at the intake to two feet near the exhaust. Hawaii's Bishop Museum is cooperating in the study.



BODY FROM 1929 FORD is dropped four inches over a reinforced 1931 Ford frame. Nose section is handmade from sheet metal, as are the motorcycle-type fenders. Centers of the chromed wheels were cut out and rewelded in

reversed position for a deep-dish effect. Cadillac engine packs six carburetors, 12.5:1-compression heads, hot camshaft, and magneto ignition. Individual exhaust pipes, sans mufflers, reduce back pressure. Car is for show only.

Cars That Detroit Never Built

EARLY FORD FOUR-BANGERS aren't dead. With an assist from a special two-port head, radical camshaft, and other speed equipment, a Model B 213-cu.-in. four-cylinder engine drives this diminutive dragster through the quarter-mile clocks at over 100 m.p.h. in 13.05 seconds.





FOR GREATER TRACTION, the supercharged Chrysler V-8 in this '27-Ford-bodied roadster is placed behind the driver. It puts more weight on the rear wheels. Nose and cowlings are handmade. Holes in the chromed front end

are for weight reduction; a motorcycle contributed the lightweight front wheels. Rated at 850 hp., the engine has pushed the car to half-mile drag time of 184 m.p.h. Sleek finish is purple lacquer—54 costs of it.

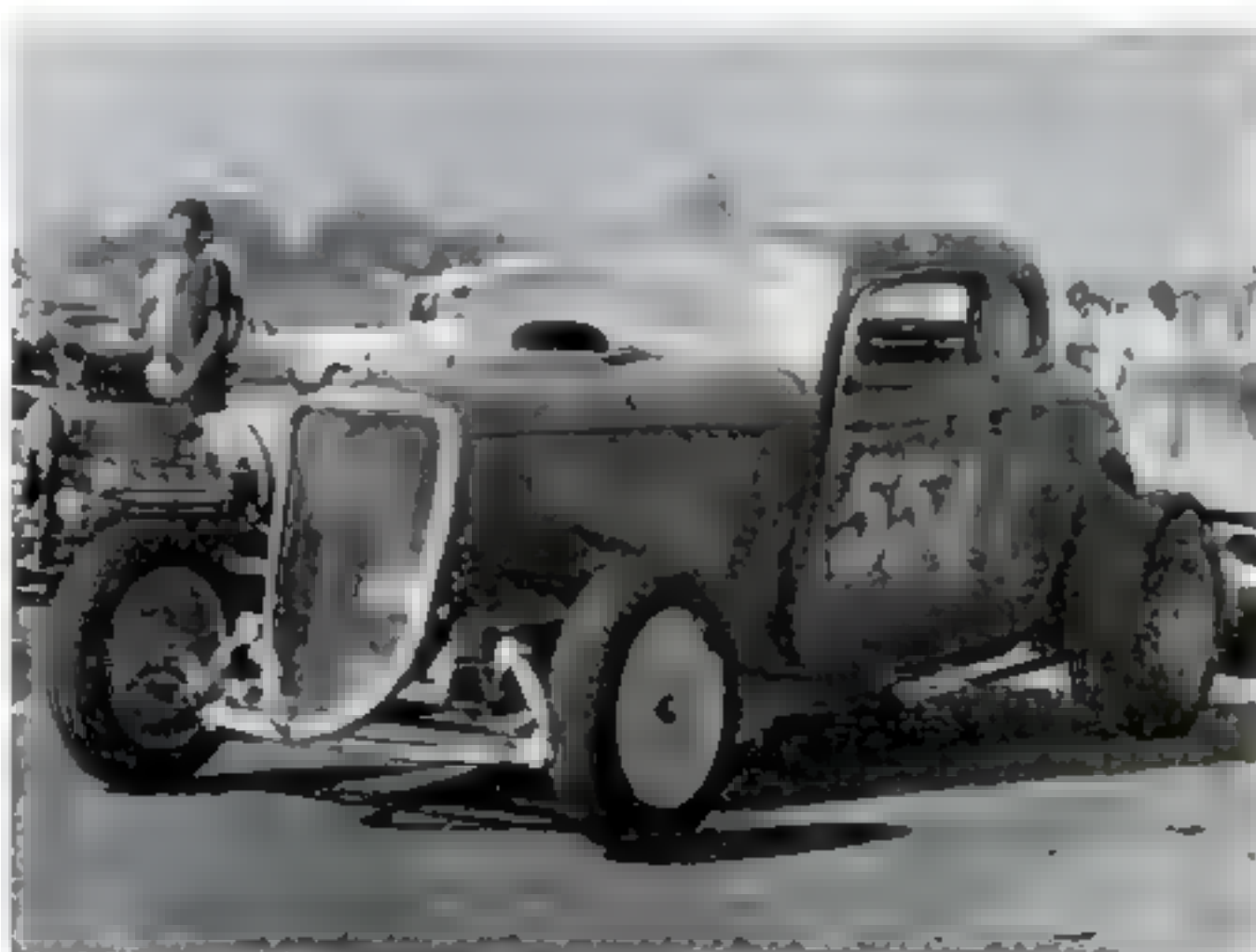
THAT stubby little hot rod down the street may look like junk parts thrown together. But it might just be capable of dusting off your brand-new Detroit iron.

There's a sure-fire formula that gives these hybrids their punch. It consists of an early, lightweight body (preferably a roadster or coupe); a small, sturdy frame; a late V-8 (usually modified with mail-order speed equipment); and, most im-

portant, the ingenuity that comes with a labor of love.

Most hot rods are designed for drag-strip competition. At the end of a standing-start quarter mile, the fastest dragsters reach speeds close to 200 m.p.h. in just over eight seconds. Other rods are designed strictly as fast, personalized daily transportation. A few are never driven at all; their sole function is to be towed to and from auto shows.—Alex Markovich.

LOWERING THE ROOF by chopping out three-inch sections of the posts cut down wind resistance of this 1934 Ford Coupe. Stock frame crossmembers were replaced with tubular counterparts for greater strength. Transparent Plexiglas in the grille shell discloses an engine compartment without a radiator; the engine, a 575-hp. Chrysler V-8, doesn't require water-cooling for short dragstrip runs.



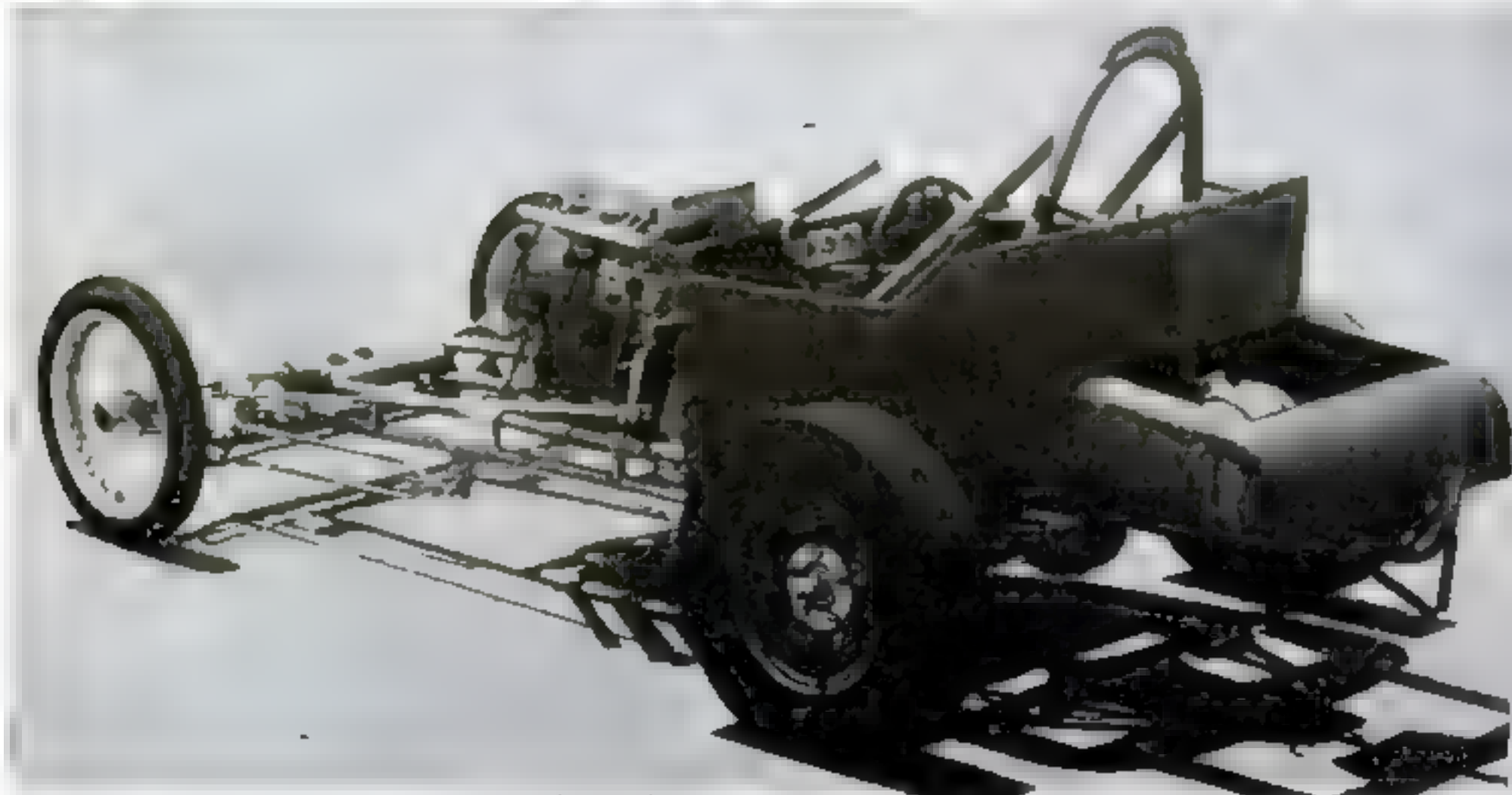
Cars That Detroit Never Built continued

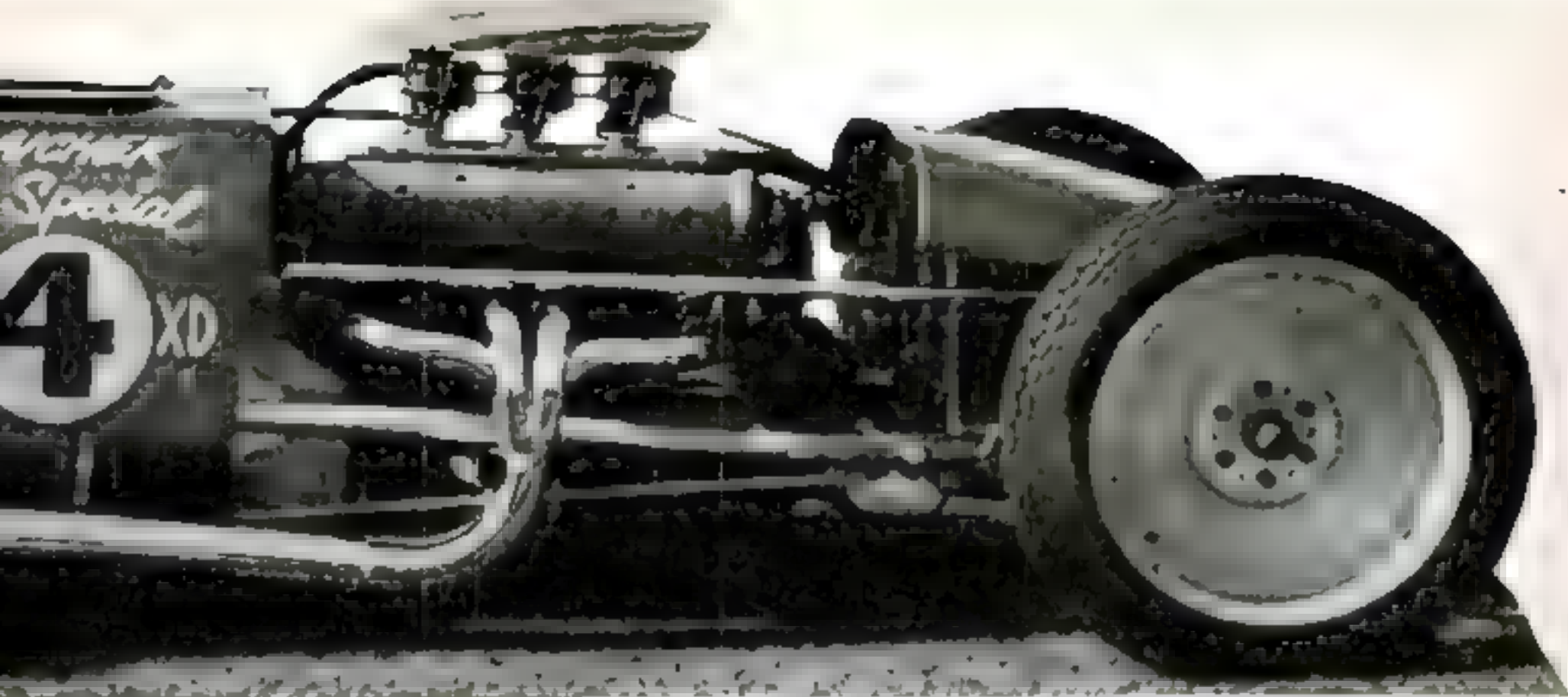
RARE HISPANO SUIZA AIRPLANE V-8 was cut in half to form a slant-four power plant for this competition rod. Quick-change rear end allows gear changes within minutes. The body is from a cut-down sprint car, the nose section is fiber-glass, and the tail section is aluminum. The Hiss Special rolls on durable magnesium wheels and has hand-made scavenger exhaust system. The old engine clocked 112 m.p.h. at drags.



APTLY NAMED THE "TWO THING," this dragster is powered by two highly modified GMC-supercharged Chevrolet engines mounted side by side. The car's frame is hand-built from chrome-moly tubing and is unsprung; rear section curves upward to give the driver roll-bar protection. Small front-mounted fuel tank holds sufficient gas for quarter-mile runs. Treadless rear tires, known as slicks, give better traction.

A '25 FORD 'T' BUCKET was mounted over this tubular dragster chassis (below) to allow the car to run in the easier Competition Roadster class. Small gas tank perches in the abbreviated turtle deck. Sturdy roll bar protects the driver in case of a spill. The Corvette power plant boasts a homemade intake manifold and header pipes. Estimated horsepower: 400.

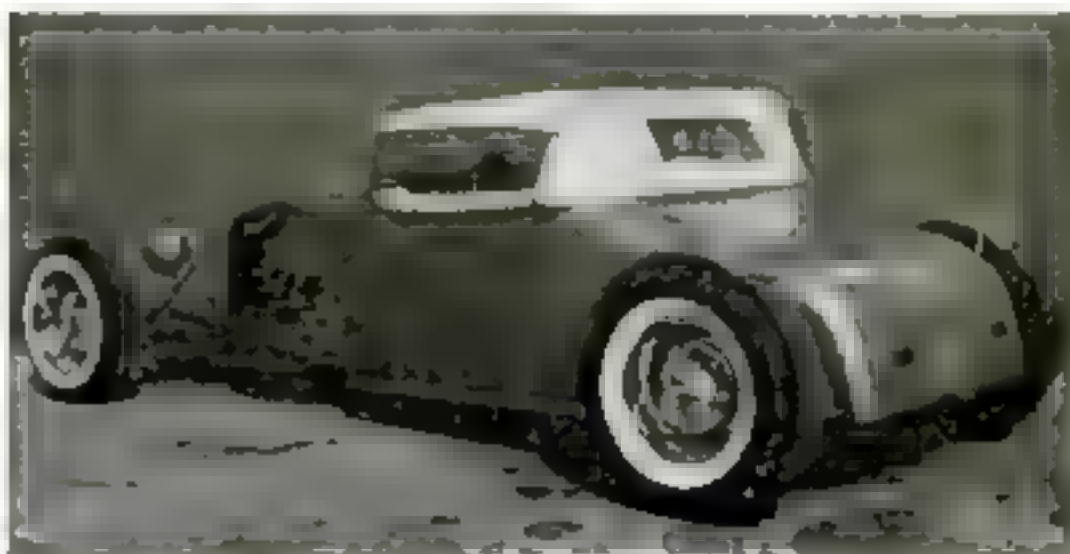




MOUNTED SIDEWAYS, the 1959 Chrysler V-8 in this unusual competition dragster transmits power to the rear wheels via a belt drive. Here again, huge treadless rear tires increase traction. A hand-formed sheet-metal skin covers the tubular frame. The GMC supercharger, mounted atop the engine and driven by belt, boosts the car to standing-start quarter-mile speeds of over 170 m.p.h. Off-beat set-up always attracts spectators.



TYPICAL STREET-AND-DRAG ROD, this 1932 Ford roadster boasts late 15-inch wheels, rear fenders trimmed and molded to the body, 1951 Pontiac tail lights, a homemade rear bumper, and a mildly modified 1948 Mercury flat-head V-8. The doors were cut down and welded shut, and headlight pods from an unidentified early truck were mounted on chromed brackets. Windshield and top bows were lowered. Paint is a blend of translucent gold with great depth and luster, but poor weather resistance.



ORIGINALLY A COUPE, this 1925 Ford was cut down to make it a roadster. To enter the doorless car, the driver tilts up the removable top and climbs over the side. The body was dropped over the frame rails and treated to Kaiser tail lights, motorcycle fenders, and a translucent gold finish. Water filler on '32 Ford grille shell is welded shut. Late-Ford hydraulic brakes replace original mechanical units. Engine is a much-chromed Corvette V-8.

New Ideas from the Inventors

.....



Platform Clamps on Ladder. This guard should make ladder-based jobs safer while increasing your reach. And the flat platform, clamped to any rung, would make

your perch more comfortable. C-shaped sleeves slide on side rails, raised by a rope and pulley, and lock. The recently patented unit folds flat for storage.

Glove Rollers Help Guide Work. The ball-tipped supports on the backs of these gloves would make it easier to guide a welding—or cutting—torch at a steady angle, distance, and speed. They'd also reduce hand fatigue, produce straighter and cleaner welds and cuts.

Offset Umbrella Covers Two. An umbrella with an off-center shaft could be rotated to give you maximum protection, shelter a companion, or keep an armful of packages dry. With the short ribs toward you when opening or closing it, it would be less likely to snag clothing.





Golf Machine Measures Drive. You'd know whether you had really connected with the ball if you did your golf practicing on a machine like this. Fastened to a revolving shaft, the ball would drive a yard-counter as it circled. You'd step on a button to reset the counter.



Teapot Brews by Color. You could always be sure of tea—or coffee—as you like it if you brewed it in a pot like this. A transparent spout would let you check the color against a graduated standard, then stop the brewing process when it reached the color of your choice.

Fifth Wheel Bucks Road Dips. A spring-supported wheel under the front or rear—or both—ends of your car might keep the tailpipe, bumpers, transmission, and

other low-slung parts from scraping pavement when you came out of a driveway or passed a sharp dip. The raised wheel would clear the paving on level roads.



More Inventors' Ideas



Cart Totes Garden Tools. You'd make fewer trips to your storage shed if you could wheel most of your gardening needs right to the job. This compact cart would serve as a storage rack for large and small tools and other supplies. Rolled out, it puts them all in easy reach.

Car Door Sets Brakes. Opening this car door would release a plunger that would set safety brakes electrically. Closing the door would allow them to be released again by hand. The automatic system would warn of partly closed doors, and might eliminate roll-back accidents caused by drivers who forget to apply their brakes or fail to set them firmly.



Tethered Copter Flies to Disasters. Whirling unpiloted to its destination, this captive helicopter could carry rescue crews and equipment or TV men and cameras to the heart of a disaster scene. Tethering cables on the launching rig would transmit power to the rotors.

[illegible]



Automation comes to hen houses

Eggs ride a conveyor belt in this chicken yard. Laid on a slanting floor, they roll into soft-plastic carriers and to a collection center of Cargill-Nutrena's 10,000-bird research farm, Elk River, Minn.

The somewhat startled-looking fowl, watching their production go by, are Ghostley Pearl White Leghorns, said to be the only hens that look like roosters. They're good layers.

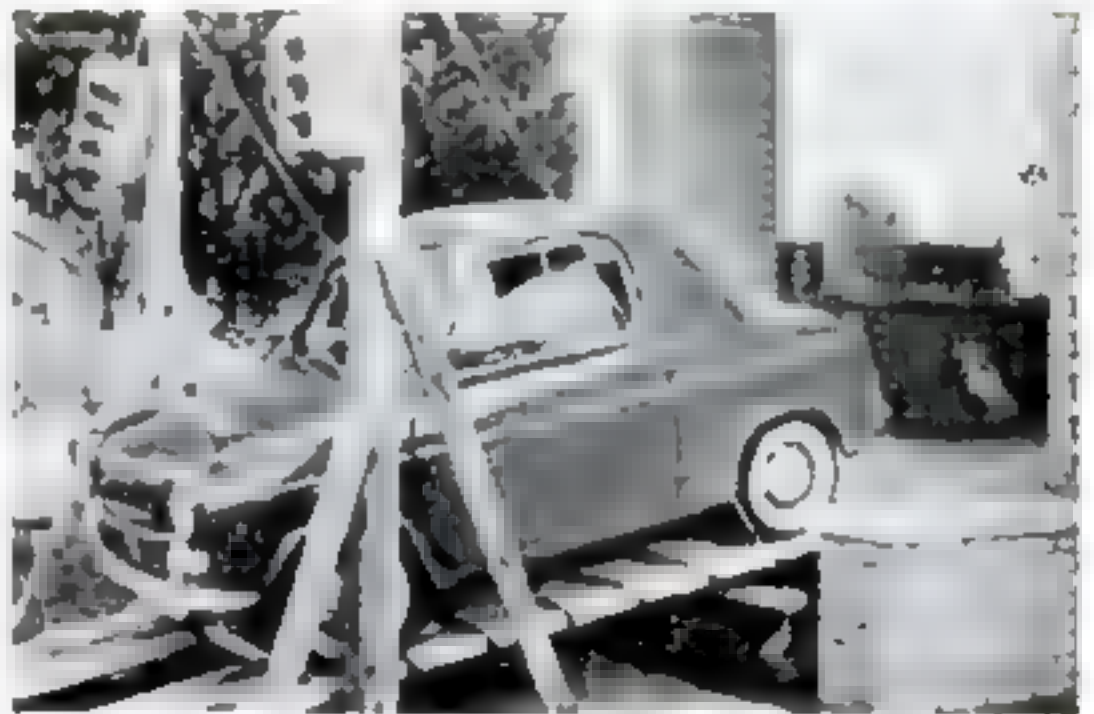


Keeps drivers dry in rainy weather

This plastic guard keeps out rain, wind, and drafts when the car window is open for hand signals, ventilation, or better visibility. The transparent shield is shaped to deflect air flow without turbulence and noise. The British-made shade, shown above on a right-hand-drive car, is attached to the window frame by three clips.



He lowers his private drawbridge . . .



. . . backs his car up onto the porch . . .



. . . leaves it there where it's high and dry.

Drawbridge car parking

If you already have one car—and only a one-car garage—and you buy a second, a tiny foreign car, how can you shelter it from the weather?

Here's one man's solution: Bruce Turney of Indianapolis built a drawbridge over which he backs his midget onto his porch where it's cozily protected. Concrete blocks counterweight the wooden structure, which cost him \$35 to build.



Nature's Most Successful Animal

**Show respect for turtles: Among the best-fitted creatures
for survival, they're still with us after 200 million years**

By George Laycock

TURTLES are dismal failures at fighting and running. They haven't much in the way of brains. They're almost deaf. Their eyesight is inferior. Their sense of smell is no cause for pride. But they are probably the biggest animal success story in the history of the world.

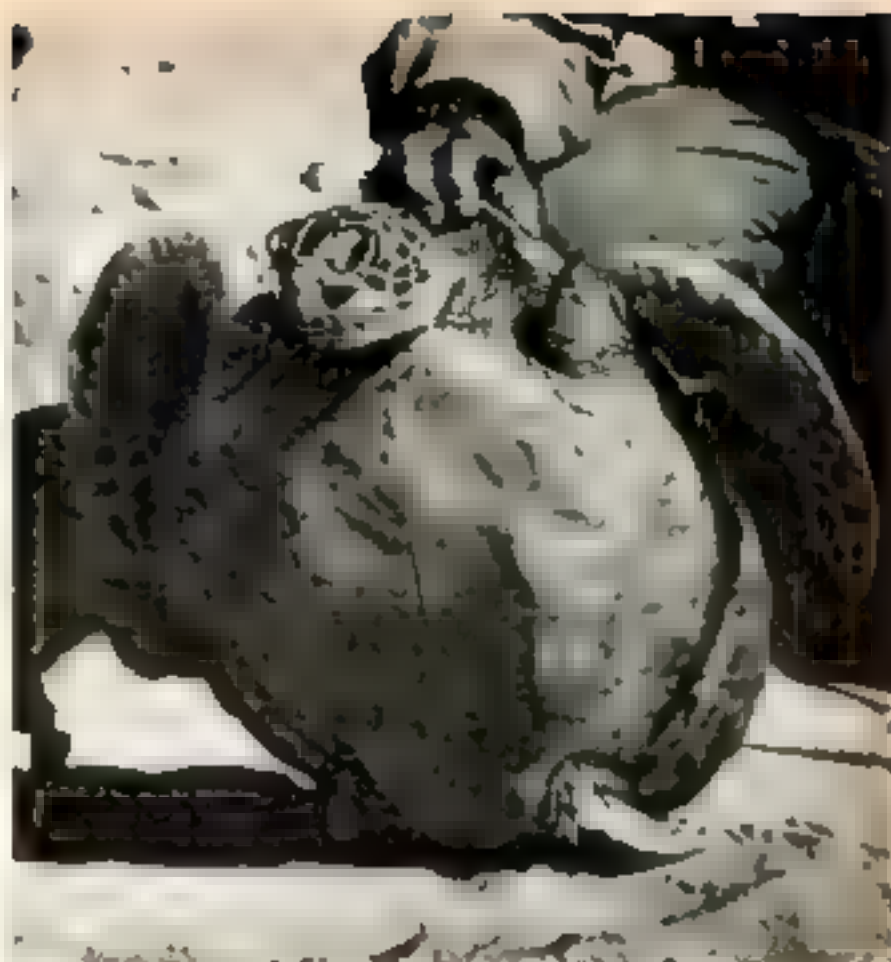
Turtles are the oldest of all back-

boned animals. They were here on earth long before the great dinosaurs, and they haven't changed much in 200 million years.

Animals that have survived by speed, cunning, strength, or keen senses might wonder how turtles do it. The truth is that they survive by *not* doing: The turtle is a model of passive resistance. That, plus his mobile shelter. Faced with trou-



"WANNA MAKE SOMETHING OUT OF IT?" belligerent snapper seems to be saying. He'd bare his teeth if he had any. Instead, this reptile strikes with rattlesnake speed, hangs on to his prey with an iron grip, and tears it apart with fierce jaw muscles. Watch out for those claws, too. They're just as dangerous.



HEADED FOR SOUP POT: Big (up to 300 pounds) green turtles, prized for their meat, are netted off Florida. Their oversize paddle arms have only one claw, but they're fine for swimming.

PREHISTORIC MONSTER No, just a species of land turtle, a sawback. (Note high ridge.) Like

most land turtles, his humped back permits him to tuck all his extremities safely inside.





SNAPPER VS. SHOE LEATHER—and shoe leather wins. But the lunge is typical. With front feet

off the ground, the snapper throws all his weight into those powerful neck and jaw muscles.

ble, the turtle is already halfway indoors. A common box turtle can withdraw and clamp his shell so tightly shut that a knife blade won't pry the sections apart.

Turtles come in great variety. Some never get bigger than a quarter. But the giant leatherback, a sea-going raft that roams tropical seas, sometimes weighs three-quarters of a ton.

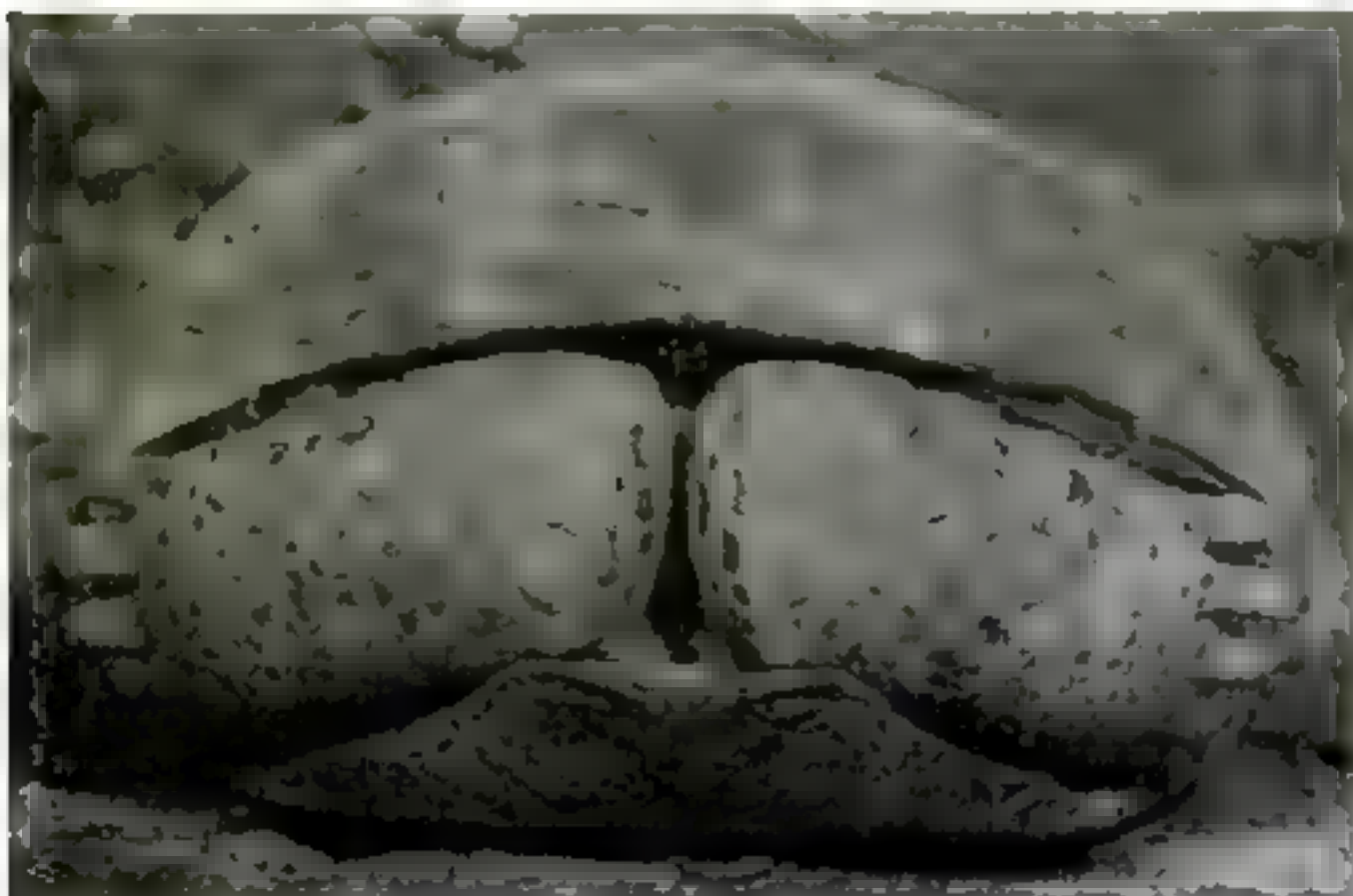
The armored tank the turtle lives in is part of his bone structure. The top—the carapace—is linked to the bottom—the plastron—through bone or cartilage. Both are attached to the soft body along the rib cage or vertebrae. Land turtles are more humpbacked than their sea-going brothers. They can draw their whole

bodies inside. Sea turtles are more streamlined, but their legs hang out.

Turtle lore abounds with tall tales. Some are true. The one about turtles being slow is not. Sea turtles, when they turn on the steam, can swim faster than most of us can run a 100-yard dash. They've been clocked at 10 meters a second—over 22 m.p.h.

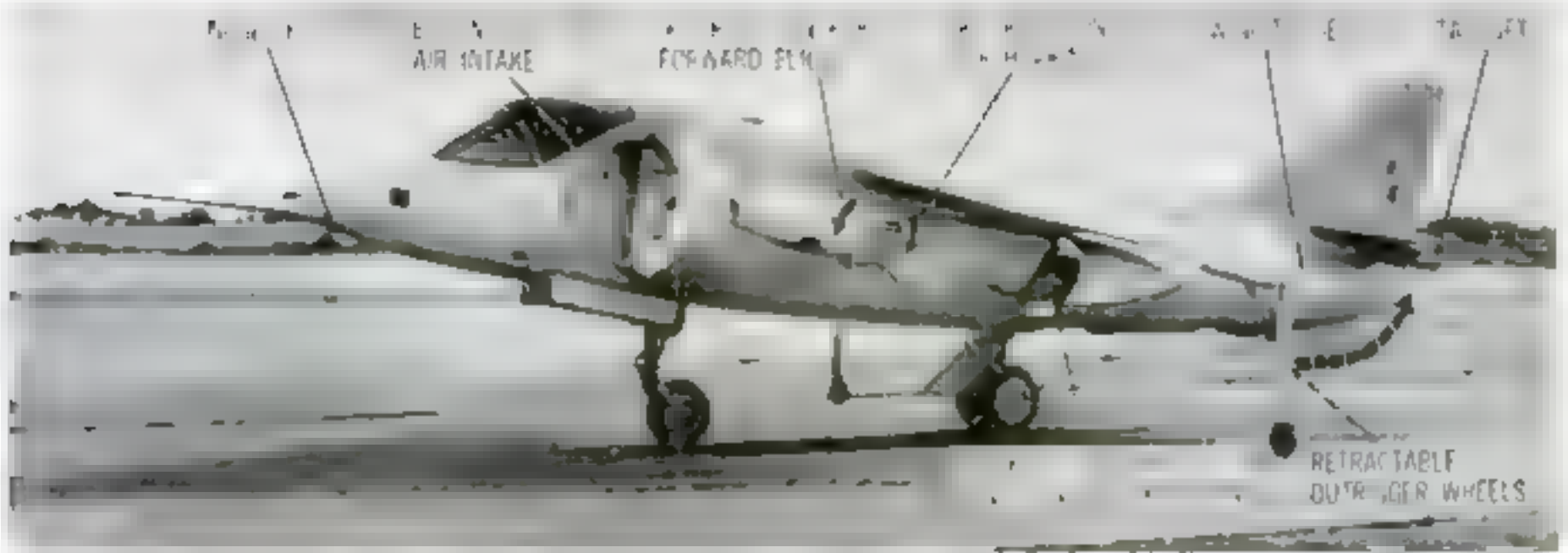
Methuselahs? But if you're told that turtles live to a ripe old age you can believe it. A common box turtle may live to be 75. The Galapagos Islands giant tortoise that Capt. Cook gave to King Longa is supposed to have passed the two-century mark. What's more, he sur-

[Continued on page 234]



VIEW FROM THE REAR?

No sir, those are a gopher turtle's front feet neatly stowed between upper and lower decks of his shell. Just as sturdily sheathed as the shell, the plated feet complete the turtle's heavy-armor equipment. Barely visible between the feet is the turtle's head showing a part of his mouth.



LOUVERED NOZZLES deflect blast down for vertical takeoff, landing, and hovering. At right

angles, they provide forward flight or braking thrust. Midway position is for short takeoffs.

New jet plane hovers on rotated louvers

This jet can take off straight up, land on a dime, and hover for an hour or more. It's a British Hawker P-1127, powered by a ducted-fan turbojet that pushes its thrust through two louvered nozzles on each side and four stabilizing nozzles on nose, tail, and wings.

Unlike the U. S. Bell X-14 [PS, Sept. '58], the louvers are not movable like slats on Venetian blinds, but are fixed on a rotating panel. This directs thrust downward for vertical takeoff, landing, and hovering; backward for forward flight; toward the front for braking; and at an intermediate downward-backward angle for takeoff from short fields.



FIRST HOVERING TEST FLIGHT shows P-1127 stripped of nose boom, landing-gear doors, and other excess weight. Talk to ground was by phone through wire hanging off plane's wing.



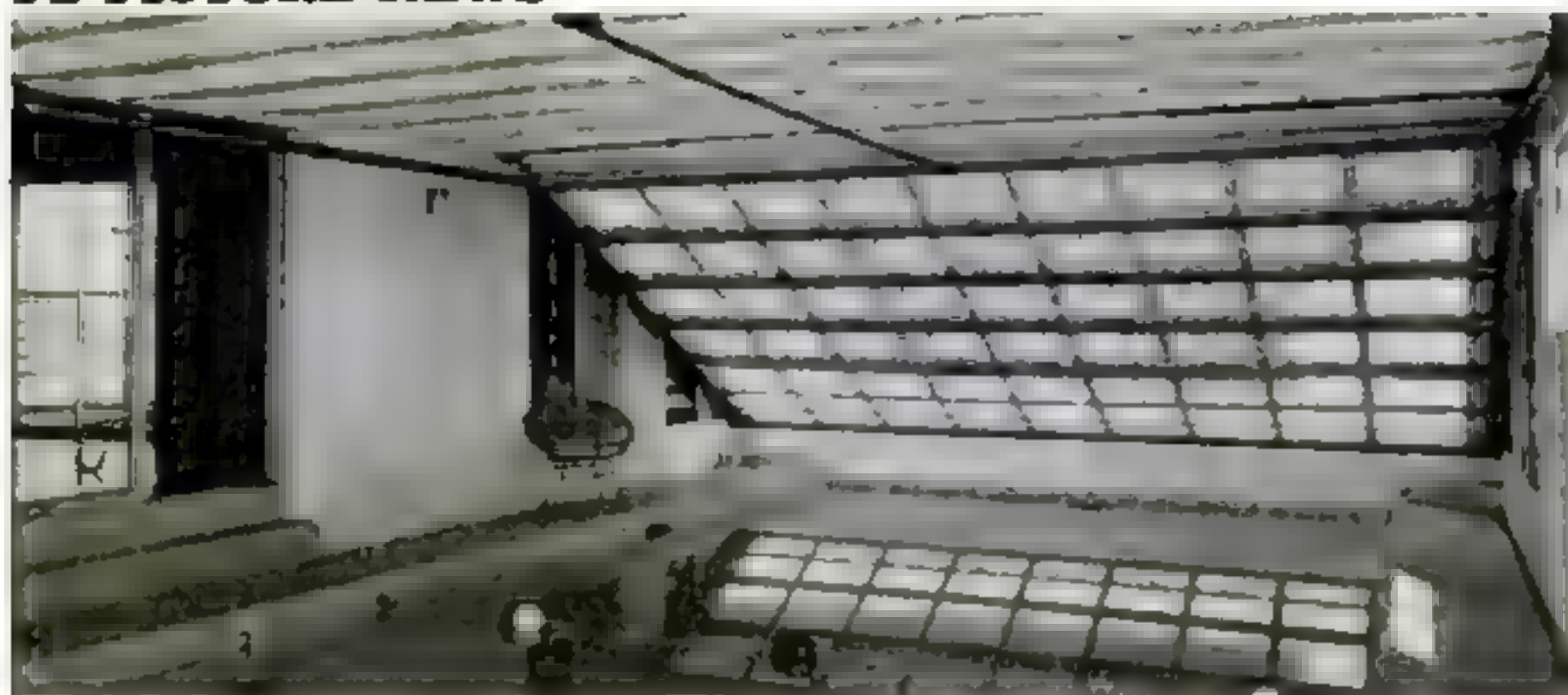
Electronic eye counts bills

One way to tell the denominations in wads of paper money is with this electronic detector. Wrap a bill around a photoelectric plate, and one of four plungers pops up if it's a one-, two-, five-, or ten-dollar bill—all four if it's a twenty. Identification is made through the types of ink the government uses in printing the bills. Automatic Canteen Co. of America makes the detector for blind newsstand operators.

What's behind this door?

Do you know—or can you guess—the new feature in house construction hidden behind this slanting garage door? To see what it is, turn to the next page.





The garage door on the preceding page hides an indoor-outdoor swimming pool . . .



. . . that can be opened to the sun in summer and on balmy days.

Enclosed swimming pool opens to sunshine

Behind the closed garage doors on the preceding page is a clever swimming pool. It's enclosed in winter for heated protection, open to warm air in summer.

Electrically operated, the sectional panel door slides up to expose 10 feet of

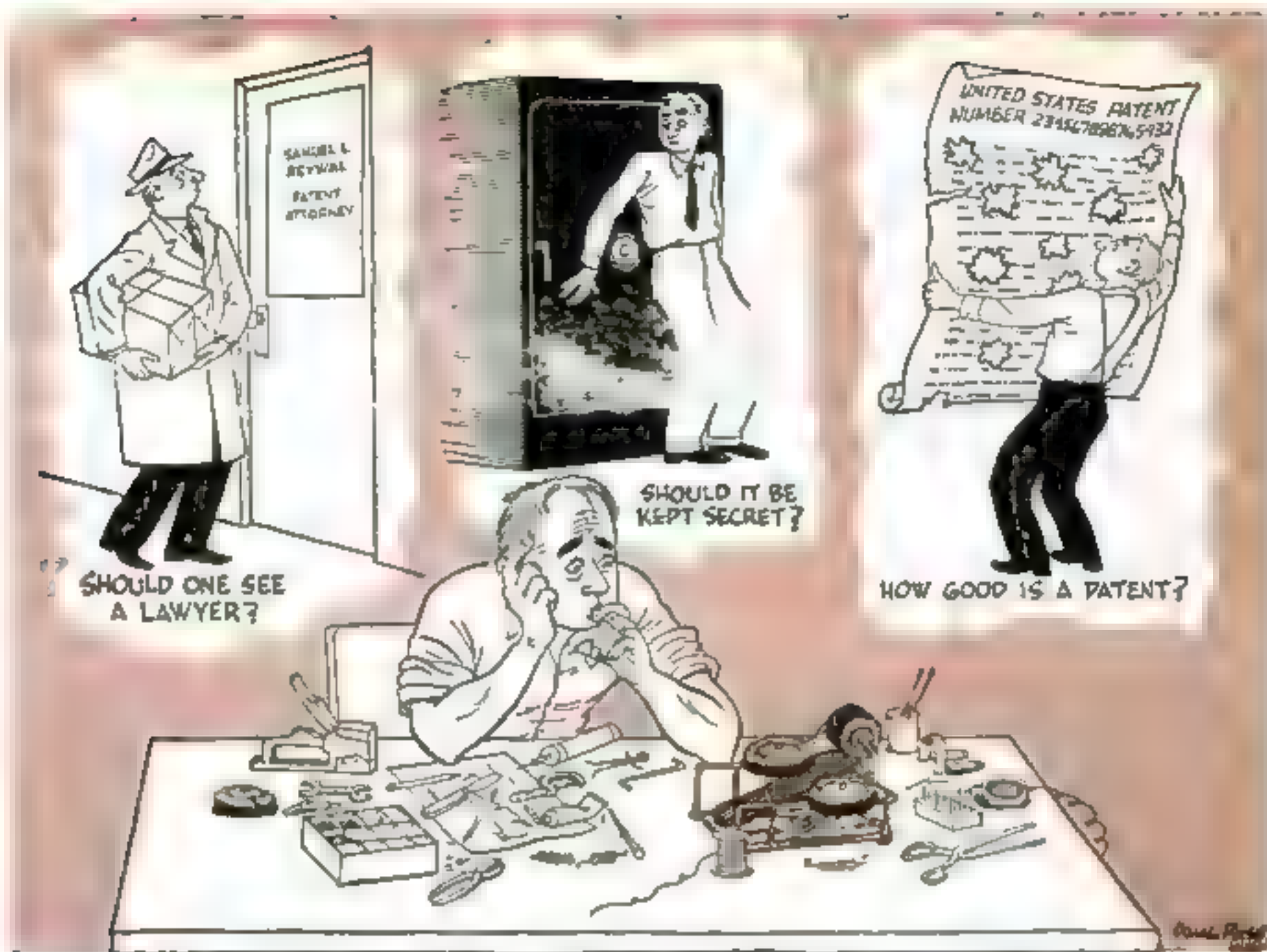
the pool to the sun. Translucent panels shed a warm yellow light on the water when it's closed. For winter, the water is heated. The display home was designed and built by Cooley-Wolsborn Construction Co. in Portland, Ore.



Knife-throwing catapult

Strong rubber bands, released by trigger action, operate the big sling-shot at left. The device propels a mean-looking dagger along a taut wire in an American movie, "Francis of Assisi," being filmed in Italy.

Shot off screen, the catapult creates the illusion of a knife being thrown. The wire goes past the hero's head. The knife, held to the wire by loops, misses by a scant inch. Lighting makes the wire invisible.



STRAIGHT TALK TO INVENTORS: 3

How to Protect Your Valuable Ideas

Getting a profitable idea is tough enough. But if it's truly valuable, holding onto it may be tougher still. There are tricks to safeguarding inventions—a patent isn't the whole answer.

This article—the last in the POPULAR SCIENCE series, "Straight Talk to Inventors"—shows what you can do to make sure your ideas pay off for you instead of for somebody else.

By Martin Mann

WHEN you think up a new idea, your next problem is what to do with it. You have three choices:

- You can keep it secret.
- You can put it to work, ignoring imitators.
- You can apply for a patent.

Many amateur inventors think only of the last course. They regard a patent as a government-backed guarantee that they and they alone will get rich on their in-

ventions. Experience-hardened pros snort at this notion. The big majority of patents never make anybody rich. And many an inventor has made his pile without a patent.

There's no basic patent on the Toni home permanent. Richard Harris thought up his curl-it-yourself kit in 1943, and lost \$25,000 on the first try. So he improved the product (ready-mixed liquid instead of powders), renamed it, jumped the price 500 percent (the low price of the old stuff made women suspicious of

CONTINUED

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it), and took off from there. A decade later he sold the business for \$20,000,000.

Yet most of the time, most inventors are better off with a patent. The shrewd ones always go through the preliminary record-keeping business. This at least helps prevent some Johnny-come-lately from getting a patent on your idea.

Don't forget to write it down

You have to be prepared to establish priority—prove that you thought of the idea first (Alexander Graham Bell's telephone patent hinged on days). The big corporations require their lab men to make daily notes and sketches in bound record books—a dime-store composition book is okay, but loose sheets are no good. Save bills for materials used in models and experiments. Take photographs. Make sure everything is dated.

And tell somebody about it

The old trick of sealing records in an envelope and mailing it to yourself, relying on the postmark to prove the date, is far from infallible—a sharp lawyer can discredit such evidence by showing how easily it could be faked. The testimony of reliable witnesses is better proof. So explain your idea to trustworthy friends. Get them to sign, before a notary, a complete description. Make sure your witnesses understand what you are talking about. Your wife would be trustworthy, all right, but her testimony might not be

very convincing, particularly if the invention were a new transistor circuit.

But don't tell everybody

Even though you are well prepared to prove that your invention is yours, you don't want to be forced to do so. That takes time and money. The fewer the people in on your idea, the safer you are.

How do you go about getting a patent, anyway?

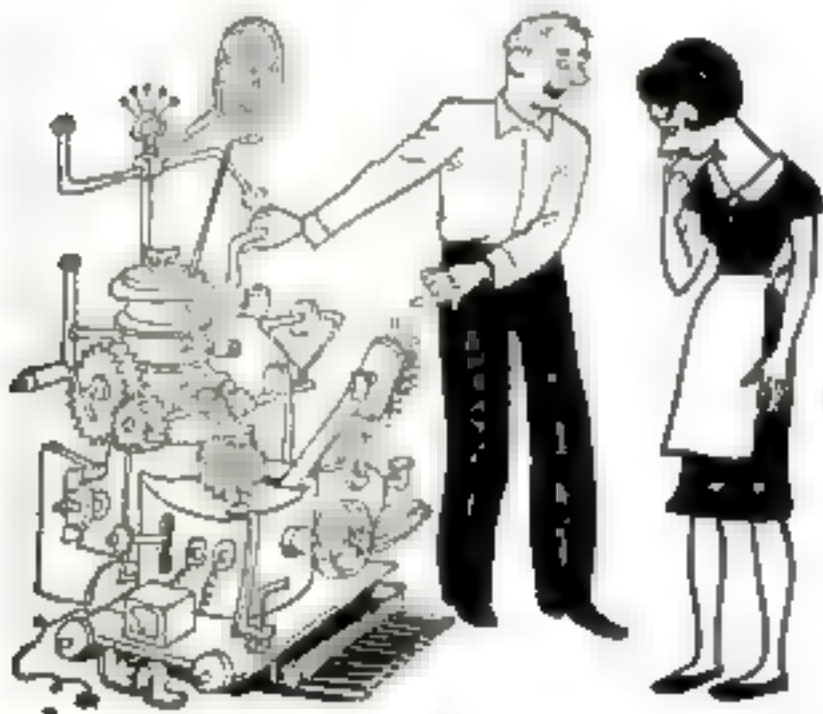
You can do it yourself, and some inventors do. The Patent Office will help with blank forms and instruction booklets. However, a patent has to be airtight to be worth anything. So most inventors rely on specialists—patent attorneys officially registered with the Patent Office. Most patent attorneys are lawyers (licensed to practice law); those who are not are classified by the Patent Office as patent "agents." You can buy (35¢) a list of registered patent attorneys from the Patent Office, or you might ask your personal lawyer to recommend one.

First, make sure it's really a new idea

The first step is a search. You can check catalogues and textbooks to make sure you haven't re-invented something old. But then you have to go through existing patents to see just how much you can claim as your own, new, patentable invention. Obviously you can no longer get a patent that would cover all torque converters; you might win rights to a specific design or arrangement of parts in a torque converter.

Complete sets of U. S. patents are available in 21 big libraries—such as Los Angeles Public, Boston Public, Oklahoma A&M College at Stillwater, Franklin Institute in Philadelphia. Incomplete files are located in 300 other libraries. These sets are bound in numerical order. To search an invention in them, you have to go through a complicated rigmarole of checking indexes and subclass lists.

Only the Search Room in Washington now has patents filed by subject so that you can quickly find all patents on a particular kind of invention. The Patent Office plans, however, to provide outside



Explain your idea to somebody who understands what you're talking about.

Your wife's testimony on a new transistor circuit might not be very convincing.

The first step is a search. You can check catalogues and textbooks to make sure you haven't re-invented something old.



libraries with microfilm copies of its filed-by-subject patents.

Many inventors make their own searches (it's a good way to get ideas). Your attorney can do it for you. Or you can hire a free-lance searcher. A satisfactory job costs around \$50.

Why a patent may not always be your best bet

A smart attorney can get you a patent on practically any new idea. It costs about \$500. But sometimes that dough would be more wisely blown on a vacation.

You can claim exclusive rights only to the specific new things you think up, and must exclude all old inventions. The longer this statement of claims—the more restrictions it contains—the less the patent is worth.

A patent that claimed simply "folding tables" would be very valuable. It would cover every kind of table with folding legs. But if the claim ran on and on with many specific restrictions—"table, with legs folding to the center on spring-loaded hinges and locking with a bolt . . ."—the patent would be a handsome document suitable for framing and nothing more. Anybody could get around such a patent just by using different hinges.

Back in the Thirties, Charles Elsenheimer invented a can punch—a knob with teeth for opening the holes in a cleanser can. He couldn't get a patent, he found, because his invention simply combined features of two older punches (a new combination of old ideas is usually unpatentable). But close reading of the old patents revealed that they were worthless. Their claims were so narrow they

did not cover Elsenheimer's version. While they could block his patent, they couldn't stop him from putting his device on the market.

(This is only a half-success story, reports Elsenheimer, a professional inventor now developing spectacle parts. While the punch interested both the Bab-O and Dutch Cleanser people, neither bought. The model is in his attic.)

Alf Berle and L. Sprague de Camp, in their treatise "Inventions, Patents, and Their Management," give a rule of thumb: If a claim takes up more than half a column when printed in the Patent Gazette, it is probably too narrow to be worth anything.

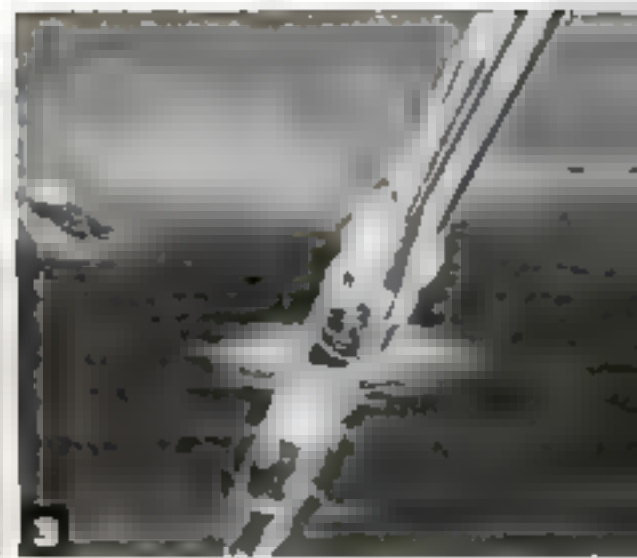
But there are exceptions. Berle and de Camp cite one: the Lift-the-Dot fastener invented by Fred Carr half a century ago for auto tops and curtains. Even in those days, so many types of fasteners had already been invented that Carr could make only a long, very narrow claim in his patent. Yet it was good enough to build a large and exceedingly prosperous corporation.

Sometimes secrecy is the smartest policy

A patent gives you the right to stop others from using your idea—after you have told them what it is. Sometimes you can't know when others are using your idea. Then it might be wiser to keep mum and never apply for a patent.

Secrets always leak. And you lose your right to obtain a patent unless you apply for it before using the invention for a year. Still, many industries rely on secrecy. You're unlikely to get a tour

[Continued on page 244]



SPACESHIPS TO MARS, Venus, and the moon will be launched from ocean this way, experts foresee: Assembled in drydock (1), giant rocket is towed to sea (2) and up-ended, for launching, by flooding pontoon (3). Fueled from tanker (4, right), it takes on passengers, who have

been ferried by helicopter from land to flat-top tender vessel (4, left). At blast-off (5), sea water takes brunt of hot exhaust. Spent booster stage falls back into sea (6), with impact cushioned by chutes, air brakes, and retro-rockets, and is recovered for re-use.

Spaceships may blast off from sea

The giant interplanetary rockets of the near future may be launched from the ocean. Too big to be transported by land or air, spaceships will be built in drydocks and towed to sea—where they can blast off without requiring elaborate protection from their fiery exhausts. From an unlimited choice of sites—the world's

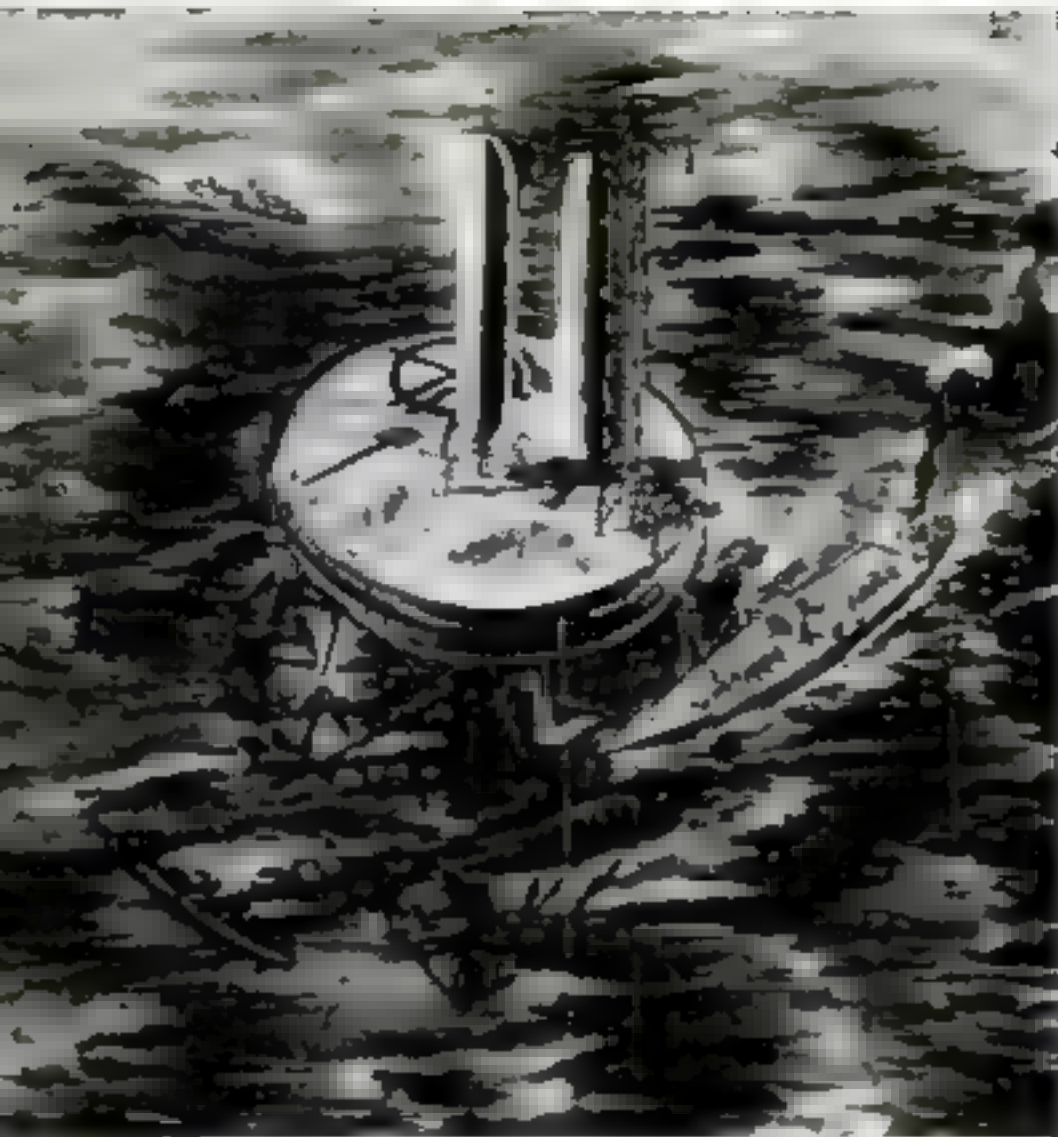
oceans, instead of the few available land installations—rockets could also launch huge satellites into any desired orbit. Falling back into the sea, a spaceship's costly first stage would be recovered for use again, keeping the expense of big-scale rocket ventures from soaring out of the budget.



Extra job for DC-3 workhorse

The eight-foot needle nose of this flying hybrid is an F-104G jet radome; in the fuselage is a mock-up of the fighter's cockpit along with test apparatus. The bulge on top houses an infrared optical gunsight.

Lockheed converted the famous Douglas airliner for in-flight evaluation of the Super Starfighter's advanced radar and fire-control equipment for our allies.



SEA PLATFORM supported by buoyant underwater chamber, in alternate plan, offers base for launching spaceships. To escape radioactivity of an A-rocket blast, launching crew descends airlock tube to leave by submarine and await cooling down of contamination.

So predict engineers of California's rocket-making Aerojet-General Corp., who are planning sea launchings for liquid-fueled spaceships by the procedure shown in numbered pictures. They are also working on an alternative system—a floating ocean launching base, which could be evacuated by submarine to escape the radioactive contamination from an atomic-powered rocket's blast-off.



Pushbutton on dash releases flare.



Firing tube is mounted at rear of car.

Automatic highway flare

This pushbutton device for placing a flare behind a disabled car is fired electrically from the dashboard. The flare is held in a short tube and is armed by a .22-caliber blank cartridge. The exploding cartridge ignites the flare and hurls it about 25 feet to the rear. A metal clip on the flare keeps it from rolling.

Gelco Enterprises, Redwood City, Calif., sells it. They hope to place it as optional equipment on new autos, trucks, buses, and motorcycles.

Beauty treatment for plain Jane

France's "ugly duckling," the Citroen 2CV, is now prettied up with a fluted hood replacing the corrugated-steel panel, stylish air vents over the front fenders, and a simple, pleasing grille. The utility model at right has a 12-hp. air-cooled engine with front-wheel drive, all-independent suspension, and a roll-down fabric roof. It's planned for U. S. sale.





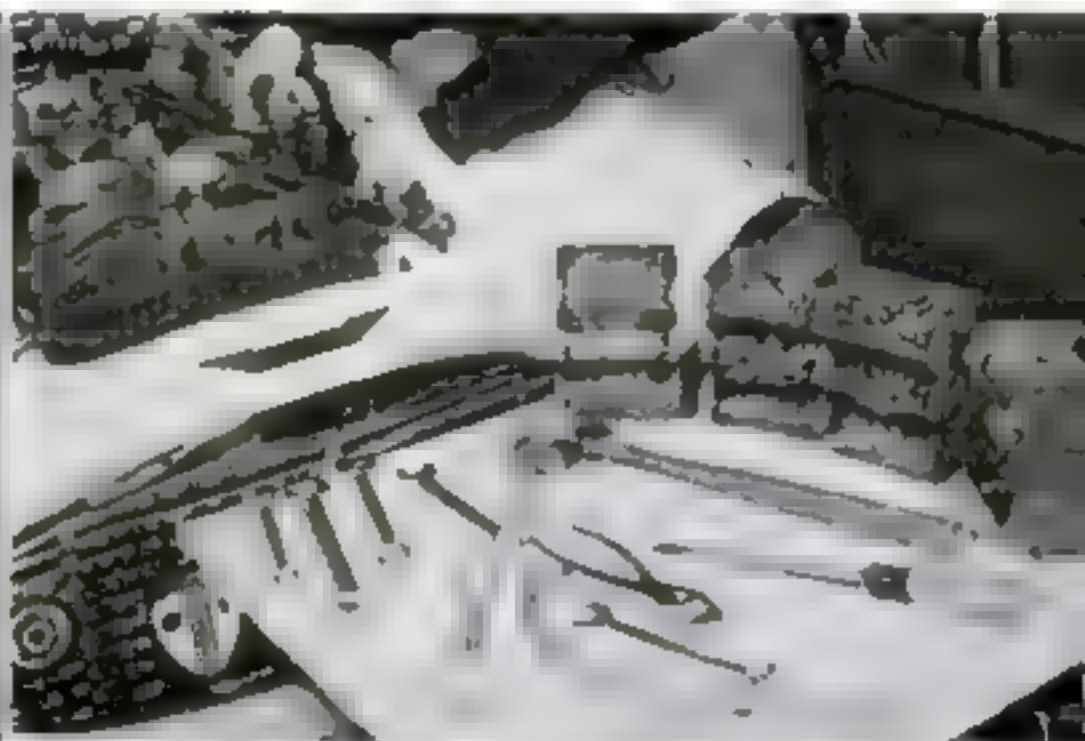
Extension Switch for Child

This push-pull light switch is meant to be mounted low on a wall so a toddler can reach it.

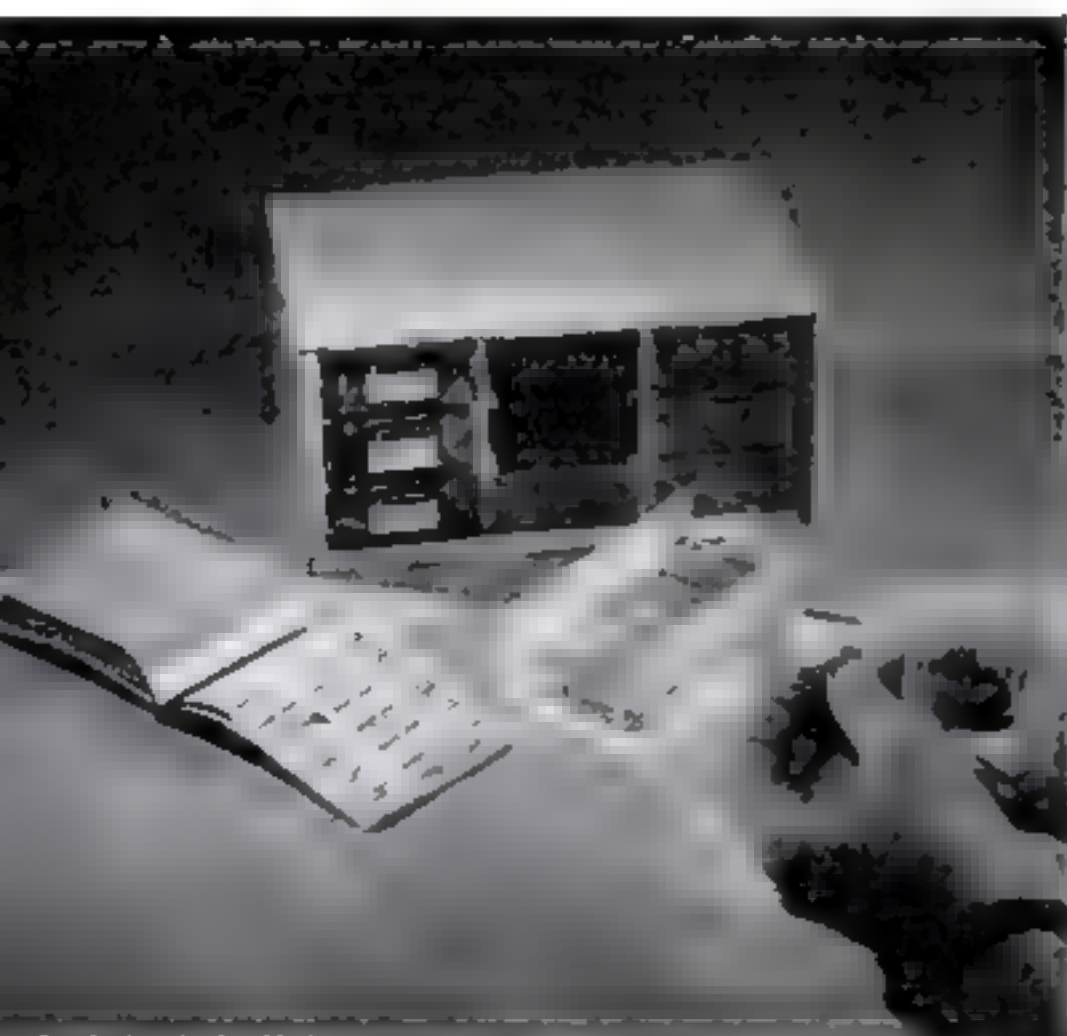
Operation is mechanical, with no electric connection, and shockproof plastic makes it safe even for wet hands. A wire with a hook on the end extends through a long sleeve which you attach to the lower wall-plate screw. Then the hook is pressed over the toggle on the wall switch. Moving a lever turns the light on or off. Price, \$1. Delaware Valley Industries, 41 Blake Ave., Cranford, N. J.



REMOTE-CONTROL PLUG lets you change oil in a car immediately after a long ride while the old oil is still hot and before carbon and sludge suspended in it can settle in the pan. The plug is connected by cable to a release mechanism you install on the firewall under the hood. Drain plug, cable, and release, \$5.95. Cosmopolitan Research Corp., 512 Roanoke Dr., Birmingham, Mich.



STACK-UP PLASTIC BINS keep bolts, nuts, and small parts conveniently at hand while you tune up or do other work on a car, at your workbench, or around the house. Handi-Boxes are 1 $\frac{3}{4}$ -by-3-by-3 $\frac{1}{2}$ inches, can be used singly or stacked securely with their contents easy to reach through an opening in front. Set of three, \$1. Container Development Corp., Box 77, Watertown, Wis.



SMALL-PARTS LABELS are pressure-sensitive for sticking on jars or drawers. A book of 400 lists many small parts used in a home workshop, including a full range of nail, screw, bolt, and nut sizes, and provides blanks you fill in yourself. \$1 a book. Kwikatik Products, Box 263, Hicksville, N. Y.



LITTER BASKET has two weighted flexible feet that you spread over the hump in a car's floor for anchoring while you drive. The plastic bin also makes a convenient receptacle for road maps, sun glasses, flashlight, smoker's articles, and other items. \$2.90. MoPar Div., Chrysler, Box 1718, Detroit.



PICKUP PLIERS will hold a nut in place behind a license plate while you turn the bolt from the front, or do other jobs in tight spots. Long-nose pliers are spring-loaded, with straight or angled tip. Price, 59 cents. Charles Gulotta Co., Cooper Ave., Glendale, N. Y.



TWO-WAY KNIFE has a blade that you can lock in position for use as a regular knife or at an angle for removing stickers or paint from windows, porcelain, or tile. With four blades and guard, it sells for \$1.50. Stanley Tools, 111 Elm St., New Britain, Conn.



CORNER CLAMP is designed to pull up mitered joints tight for gluing or nailing. You can use it on window or door casings made of stock from 1¼ to 3½ inches wide. One clamp costs \$2.95; pair, \$5.75. Smitty's Clamp, 1924 Adirondack St., Duluth, Minn.

WHAT'S NEW.....



GALAXY GLOBE is a 22-inch, inflatable, transparent-plastic spheroid with stars, galaxies, identification, and chart lines in luminescent color. Align it, look through, and you see the sky as a hollow dome. Sun, moon, and planets are tabs. \$15. Theodore J. Vincent, 1025 Yale Ave., Claremont, Calif.



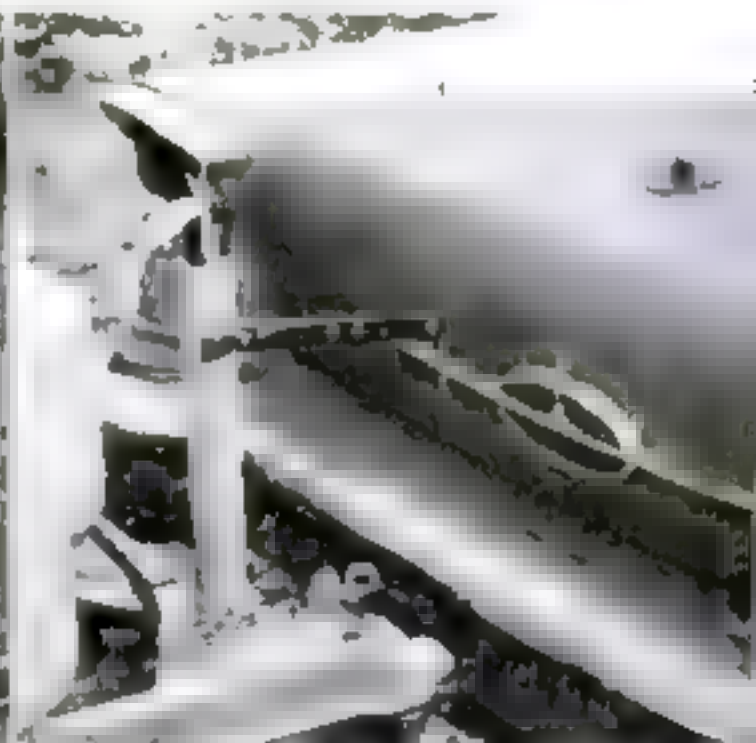
SINGLE-POLE GUN helps you to do delicate, deep-in precision soldering. The new Shopmate tool has a trigger running the length of its plastic handle to prevent finger fatigue. With a set of interchangeable tips, \$9.95; without tips, \$7.95. Portable Electric Tools, 1200 E. State St., Geneva, Ill.



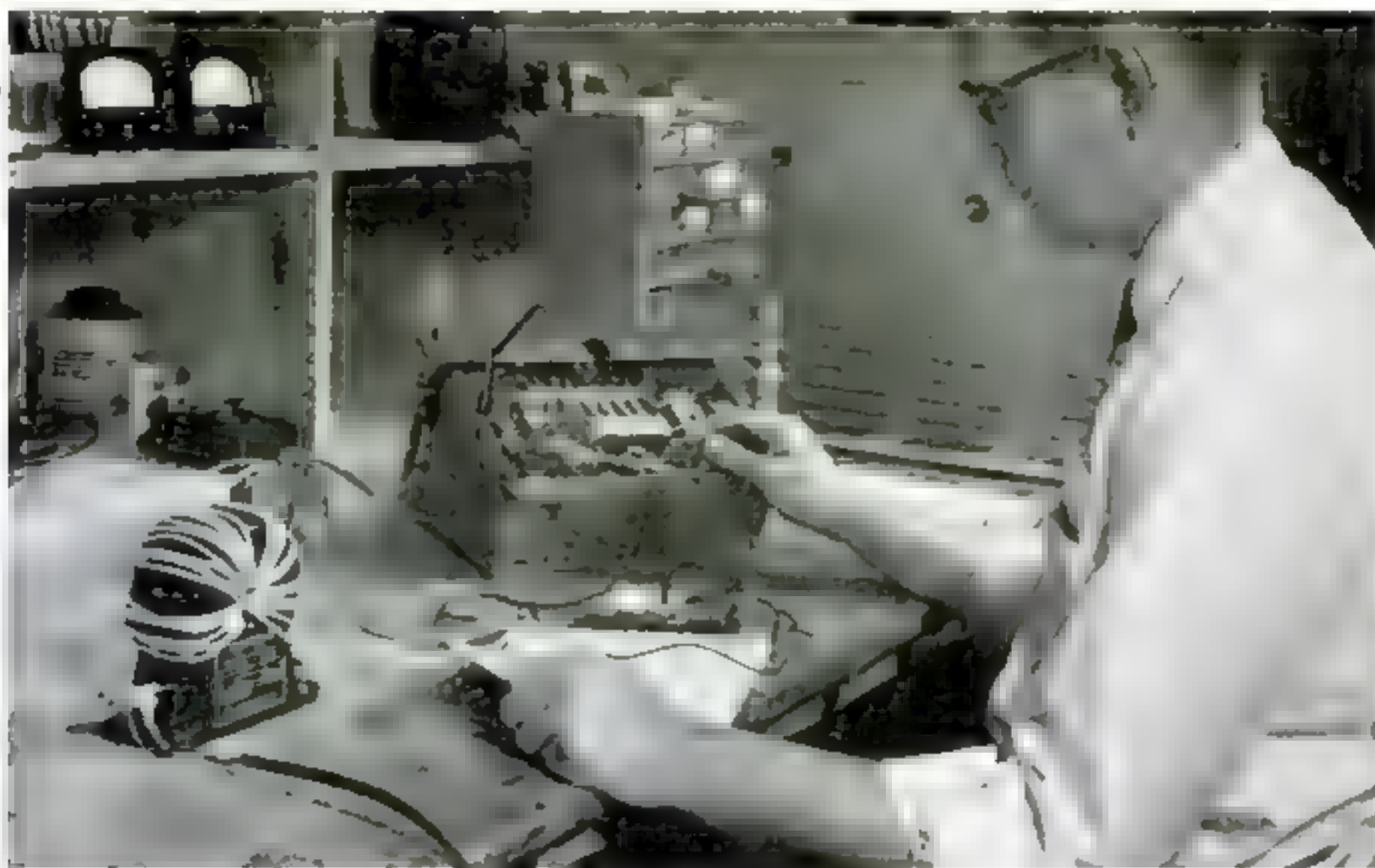
BODY-REPAIR KIT contains polyester resin and cream hardener you mix and work like putty. Repair can be sanded and painted after 20-minute set. In half-pints, pints, quarts, and gallons, \$1.44 to \$16.26. Magic Iron Cement Co., 14215 Caine, Cleveland.



PLASTIC TAPE comes in dispenser with a cut-off device that punctures and severs material at end of wrap. You can complete connections with one hand in awkward spots. A 66-foot roll, $\frac{3}{4}$ inches wide, sells for \$1.50. Johns-Manville, 22 E. 40 St., NYC.



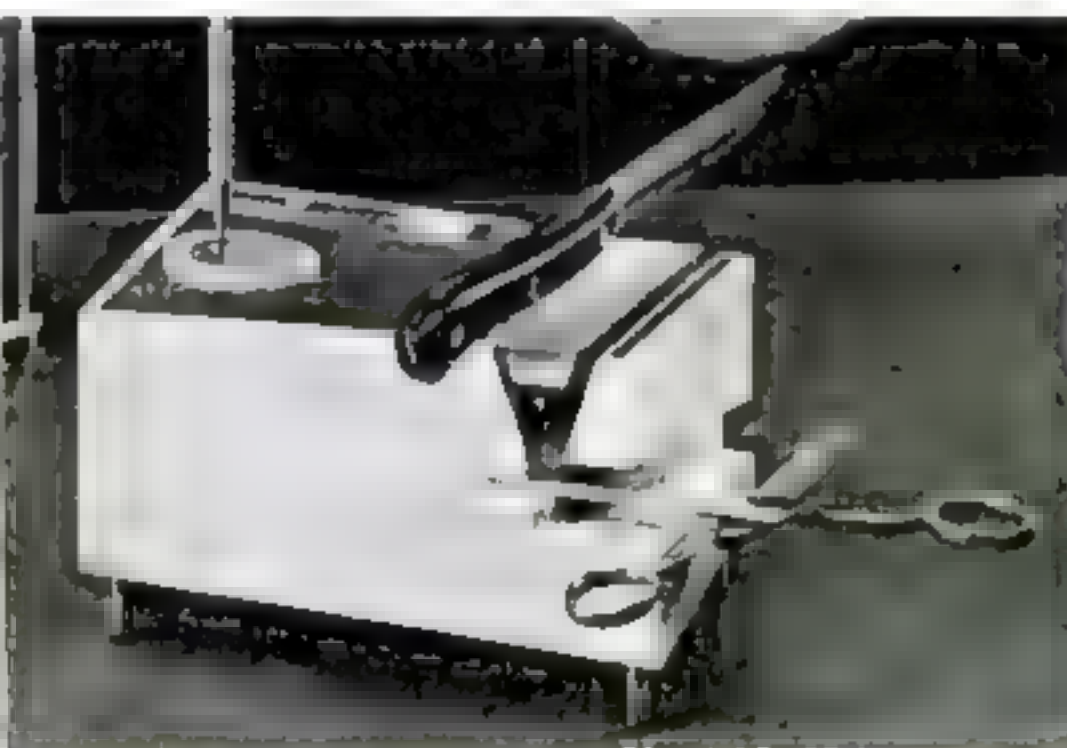
HITCH GUIDE keeps you on target as you back to trailer. Adjust upright on hitch to proper height, stick ball-end rod to car with suction cup. When ball touches disk as you back, you're lined up. \$7.25. York Industries, 1817 N. York St., Dearborn, Mich.



Do-It-Yourself Transformer

The primary of this adjustable transformer is a 400-turn coil with an input rating of 120 volts. The secondary you wind to suit yourself, threading the required number of wire turns through a center opening, each turn supplying .3-

volt output. The primary coil is encased in a high-impact plastic housing with three pairs of five-way binding posts. The maximum output is rated at 150 volt-amperes. Flexiformer sells for \$25. Superior Electric Co., Bristol, Conn.

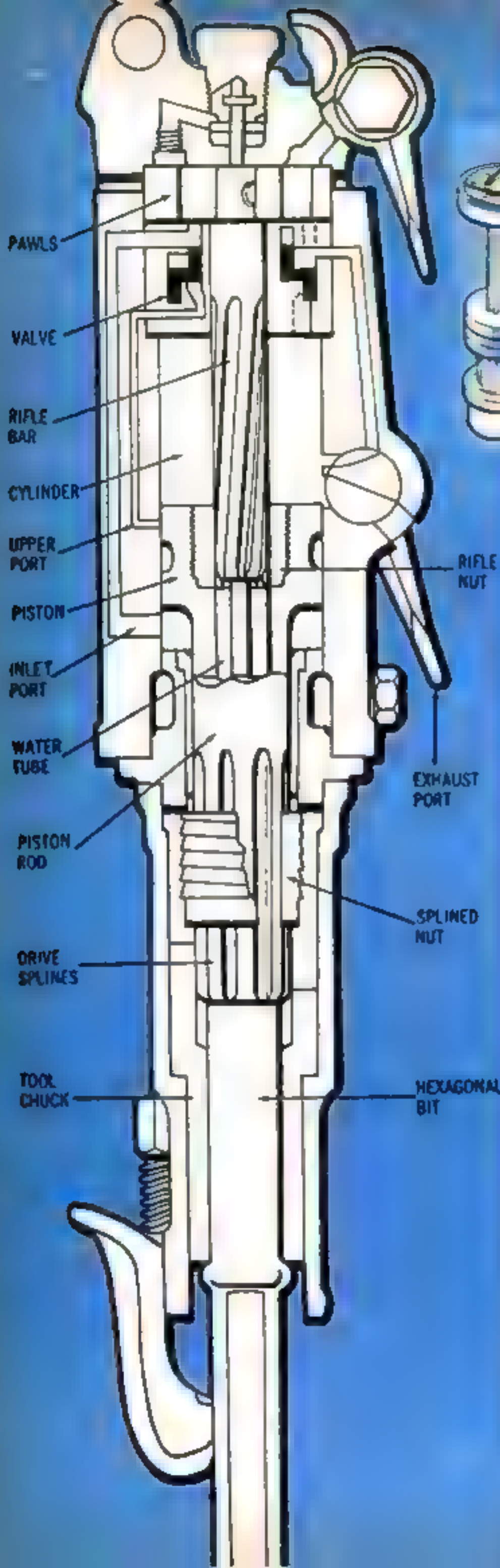


ELECTRIC SHARPENER can handle a pencil, knife, and scissors—all at the same time if you're in a big hurry. Magnetic guides hold knives in correct position for a flat edge; a shelf guides scissor blades at the right angle for hollow grinding. A disk grinder at one end takes any standard pencil and sharpens it automatically. \$19.95. General Electric Co., Bridgeport, Conn.



FLOOR TILES, made of the same asbestos, pigment, and plasticizer as regular asphalt tiles, now have a new binder added to the mix that helps them wear twice as long, yet doesn't increase the cost. They're also said to be more flexible, more stain resistant and easier to clean. Like regular asphalt tile, they sell for about 15 cents per square foot. The Ruberoid Co., 500 Fifth Ave., NYC.

How a



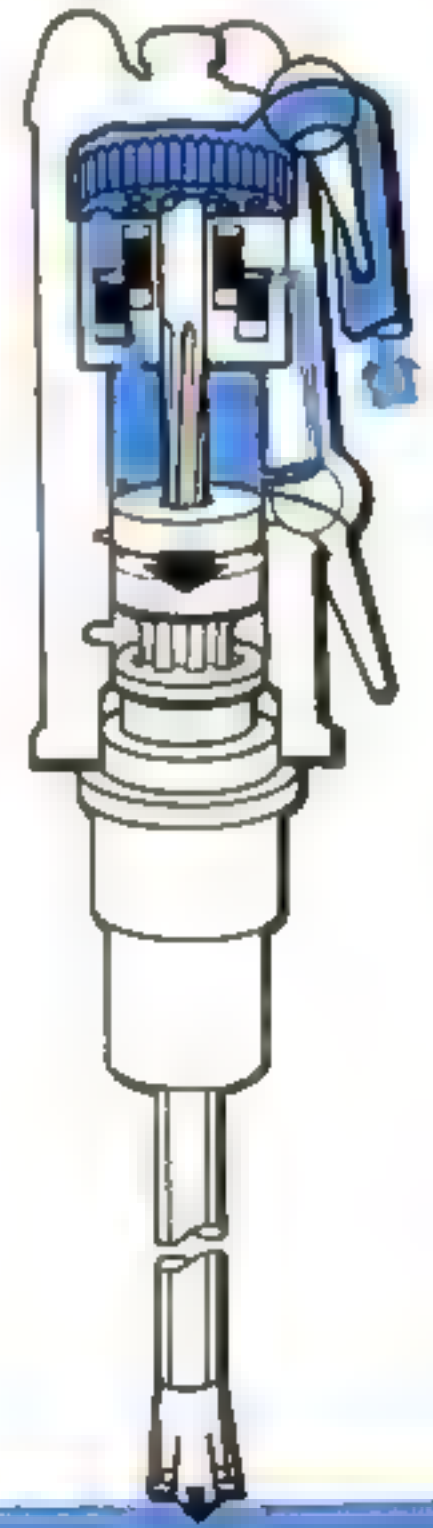
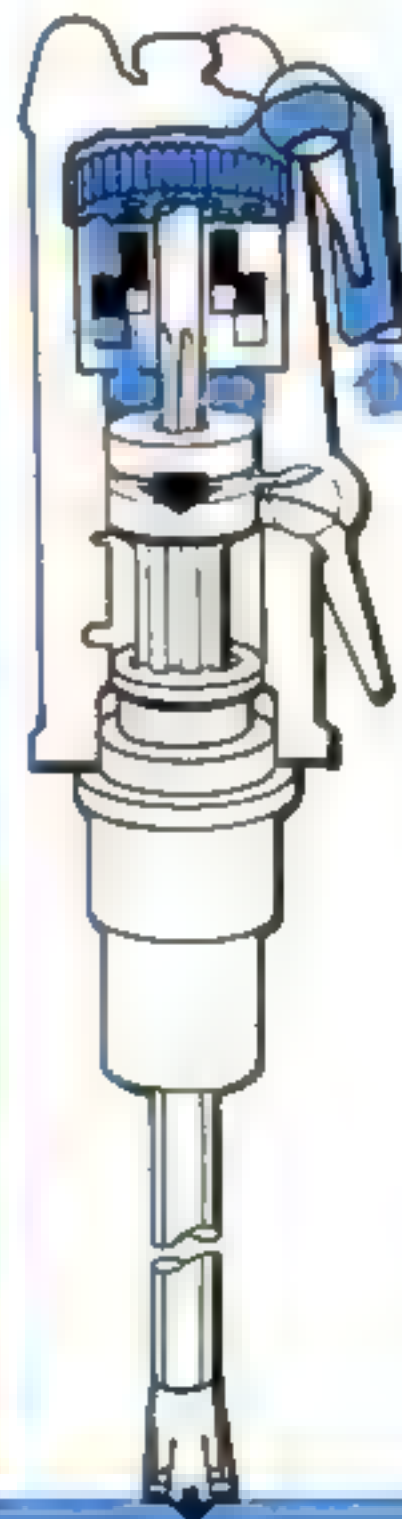
Piston stroke causes drill to rotate

PAWLS AT THE TOP of a spirally-grooved bar can click past ratchet teeth in one direction but not the other. As piston goes down (far left), pawls let bar turn counterclockwise. On the upstroke, pawls lock, hold bar immovable, so that the piston must turn instead.



AIR UNDER PRESSURE fills drill head and ratchet case above a sliding spool valve. With valve up, air gets under it, flows to top of piston and pushes piston down.

AS PISTON SLIDES by a small side port (below, at right), air bleeds off through a passage to top of the valve. So pushed down, valve cuts off air to top of piston.



Jackhammer Works

HITTING a steel bit 2,000 times a minute, an air hammer turns the bit at every blow, packs a cumulative wallop of 40,000 foot-pounds every 60 seconds.

In this country, power drills got their first bite at the 4¾-mile-long Hooeac Tunnel in Massachusetts about 1868. Rotation by a spiral-grooved rifle bar was invented by John Leyner in 1897. He also made the first one-man drills and invented the hollow bit, through which air and water flush out drilling dust that had earned dry drills the name "widow makers."

Shown on these pages is the Jackhammer, made by Ingersoll-Rand.

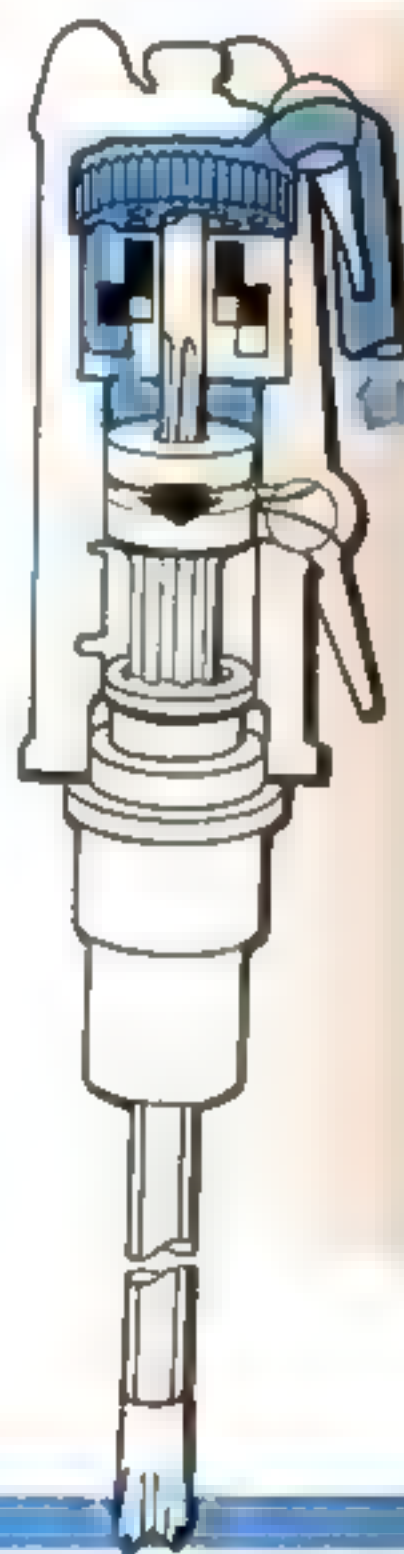
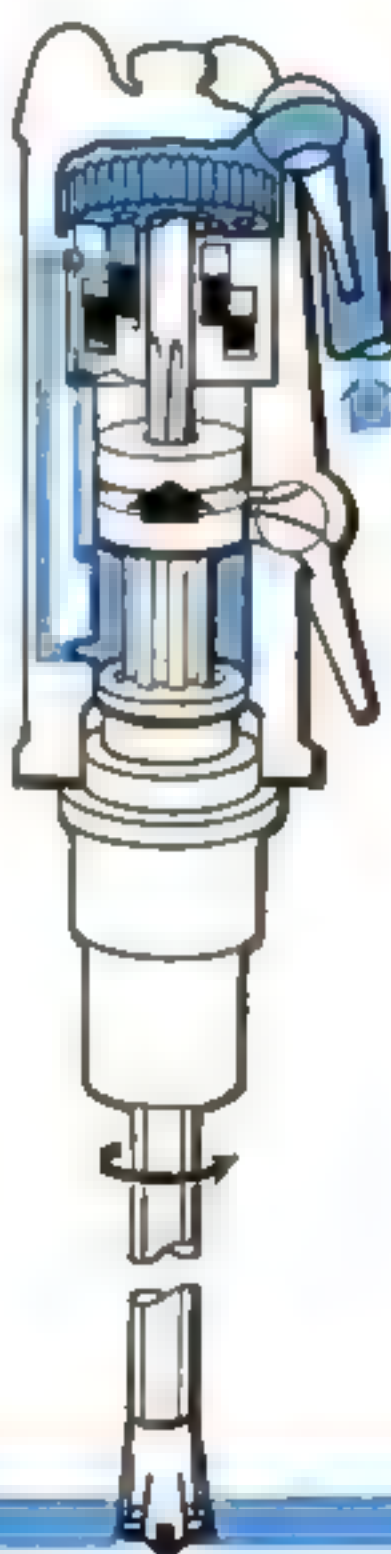
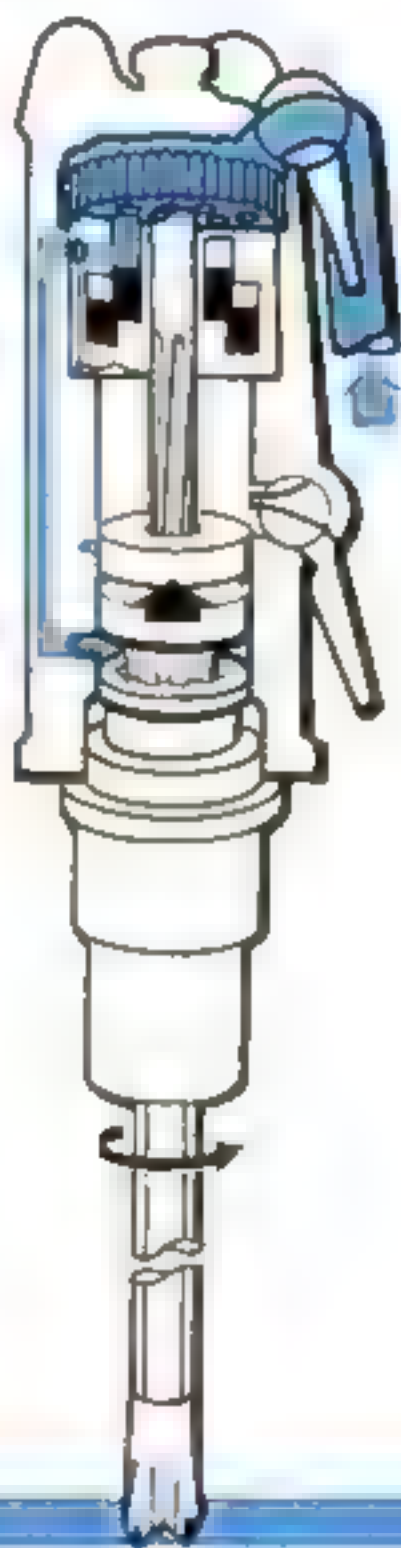
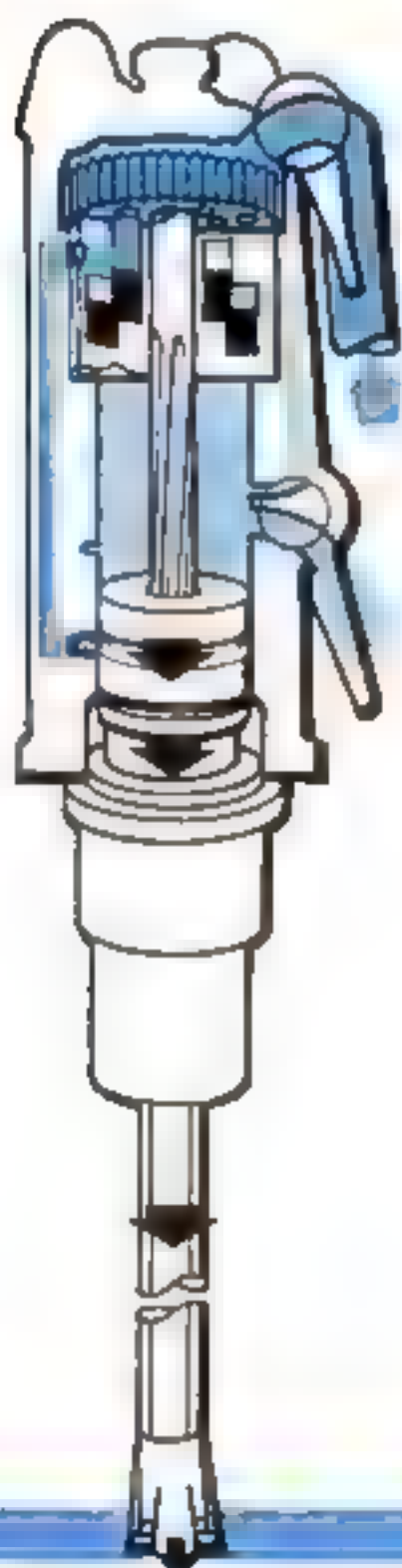


NEARING THE END of its downstroke, piston uncovers exhaust port. Air rushes out. Valve now routes air to bottom inlet port (left side of cylinder), blocked by piston.

PISTON ROD STRIKES top of drill bit. Shock and residual air under it bounce piston up enough to uncover bottom inlet port, admitting air to push the piston upward.

RIISING PISTON can't turn rifle bar, as pawls lock, so must turn itself and bit. Moving up, it uncovers upper port (also on left side) sending air under the valve to lift it.

AIR EXHAUSTS from big right-side port immediately after. The raised valve now routes high-pressure air to the top of the piston again for the next downstroke.





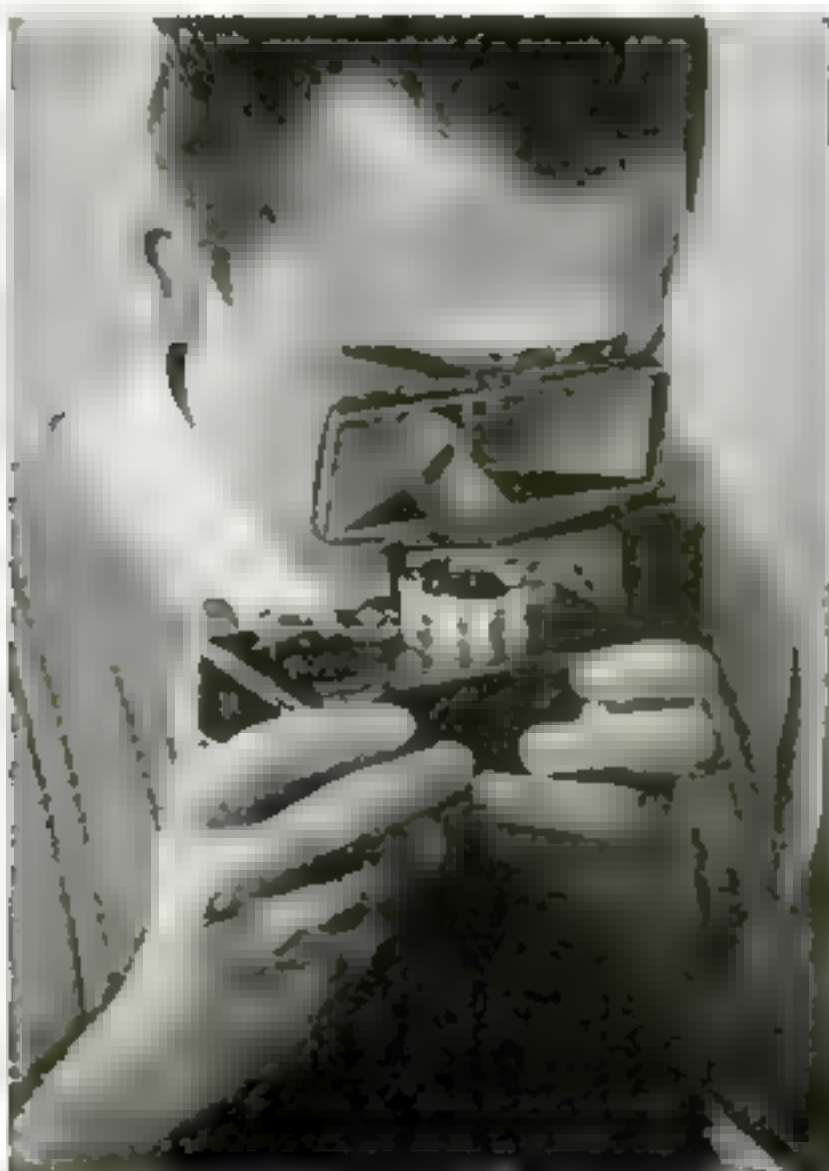
Pour chemicals into developing machine expose photo paper through negative . . .

Daylight Printer Makes

Anyone can make photoprints with this new printing and developing device. You don't need a darkroom nor do you have to know anything about photographic processing. A special-formula photographic printing paper and a tricky automatic developing and fixing machine enable you to make prints anywhere from your own negatives. Prints come out of the ma-

chine practically dry, need no washing or other treatment.

This 10-second print-making system, called Rollaprint, was invented in France. The complete kit contains 100 sheets of 3¼-by-4½-inch Rollaprint photo paper, a plastic spillproof container of ready-to-use developer, another of fixer-stabilizer, and the printing-developing machine.



New Attachment Converts Your 35-mm. Camera to Stereo

New on the market is a gadget that should spark fresh interest in stereo slides. If you shunned 3-D because you were unwilling to invest in elaborate extra equipment that you'd use only occasionally—or because of the fuss involved in mounting and viewing stereo slides—this ingenious accessory for your present 35-mm. camera should yank the rug from under your prejudices.

A mirror-and-prism cowl screws into your lens mount—directly, if your camera takes Series V filters, or by means of step-up rings in the case of Series VI or VII sizes. For the Argus C-3 (left) a special suspen-

[Continued on page 222]



... feed exposed paper into slot, turn crank ...

... and out comes the print. Time: 10 seconds.

Photoprints in 10 Seconds

To make prints using the Rollaprint process, you expose the paper through your negative on the built-in contact printer. Place the exposed paper in the first slot of the developing machine and turn the crank slowly. A series of paired rollers, like clothes wringers, are geared to the crank and carry the paper through the developing and stabilizing solutions.

The finished print—squeezed dry—comes out the second slot.

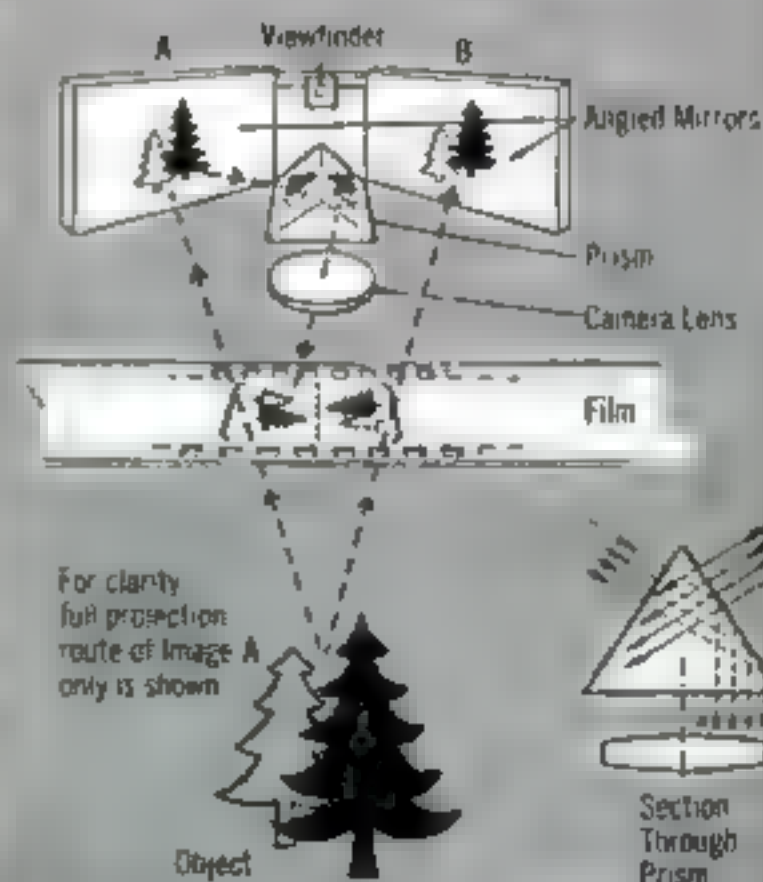
The importer, U.S. Photo Supply Co., Washington, D.C., has announced that the kit will sell for \$19.95 in most camera and department stores. Additional 100-sheet boxes of paper will cost \$2.95; developer and stabilizer to process 100 sheets of paper, \$1.95.



STEREO SYSTEMS DIFFER as demonstrated in these two pairs. One at left shows built-in distortion typical of converters that produce side-by-side images. Though picture was shot straight on, the two images "tilt" toward one another because of false perspective, preventing proper superimposition. Prism stereo's head-to-head images (right) are flat, align perfectly in viewer.

TWIN ANGLED MIRRORS project the reversed image through a prism. Each upper side of the prism bounces one reflected image down through the lens, inverting it so that the tops of the images meet at a center line in the film frame. Later, mirrors in the hand viewer unfold the images and merge them for stereo effect.

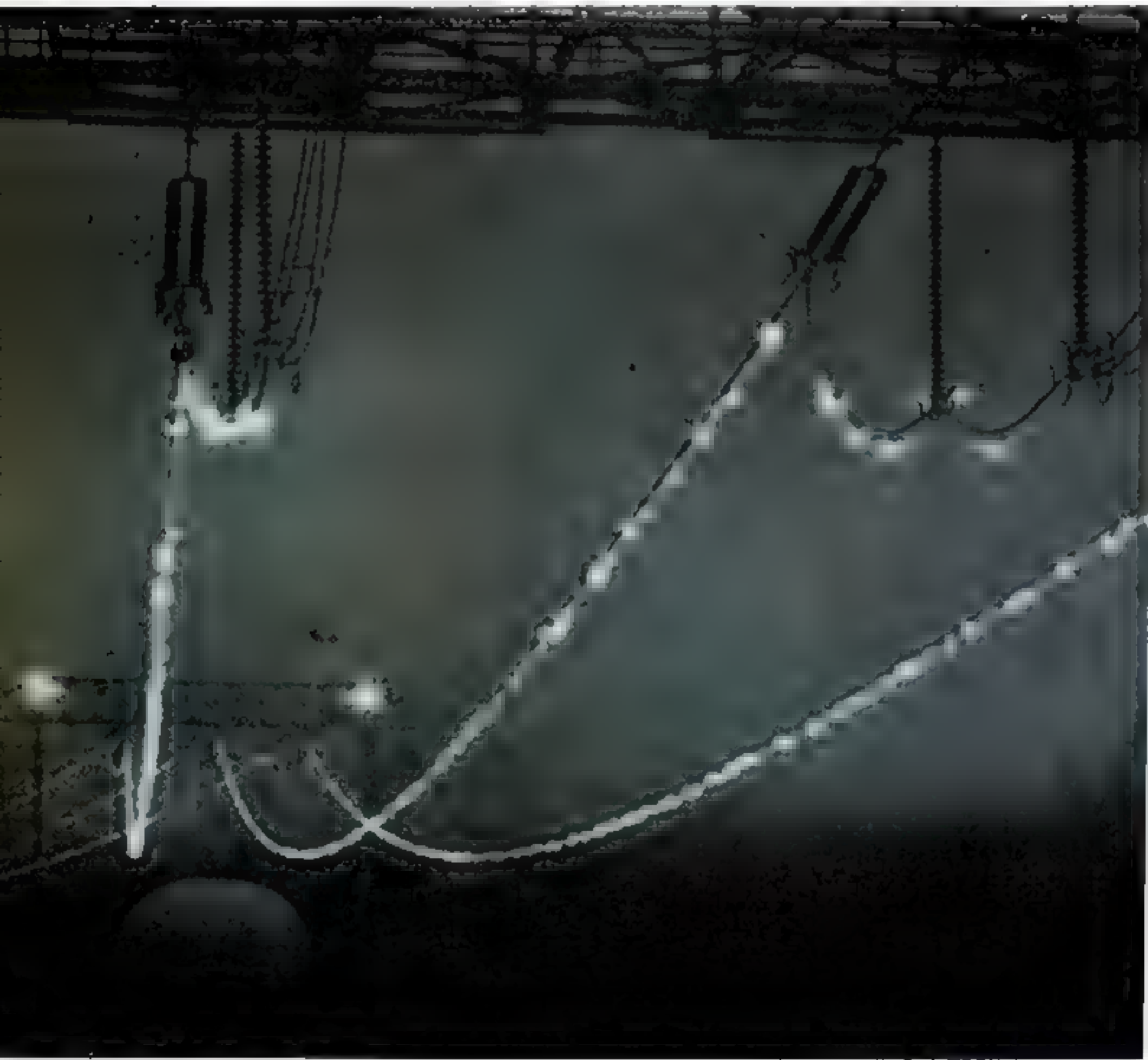
How the mirrors and prism split the image



BLUE GLOW lights up big 2.32-inch wires at about 750,000 volts in spectacular night demonstration at new GE experimental line. Test deliberately applies higher voltage than they're meant for, to show corona that engineers seek to avoid. Right conductor for this record voltage, connected to other but not glowing, is the cluster of four parallel wires that is visible at upper left of photo.

Here Come Super-Hot Power Lines

By Alden P. Armagnac





BIGGEST WIRE ever made for a power line is 2.32-inch giant, shown actual size. GE's new line is using this one for trials in range of 400,-

000 to 550,000 volts. Another version, with two outer layers of aluminum strands instead of three, is being tried on Pennsylvania line.

By harnessing record high voltages, engineers will satisfy your growing need for electricity—and keep down your bill

ATOP a steel tower near Pittsfield, Mass., I watched an electric transmission line come weirdly to life, as mounting voltage pulsed into it—more than was ever applied to one before.

A low hiss came from the bare, shiny wire hanging less than 20 feet below me. The sound rose to a buzz, a sputtering, a crackling. A pungent odor, of ozone, reached me. At that moment, 720,000 volts of electric fire was seething in the wire—and, bursting its bonds, was noisily escaping into the open air.

When the trial was repeated at night, the blue glow of the luminous discharge lit up the whole 3,000-foot length of the wire, and two parallel ones, curving in great sweeps between towers.

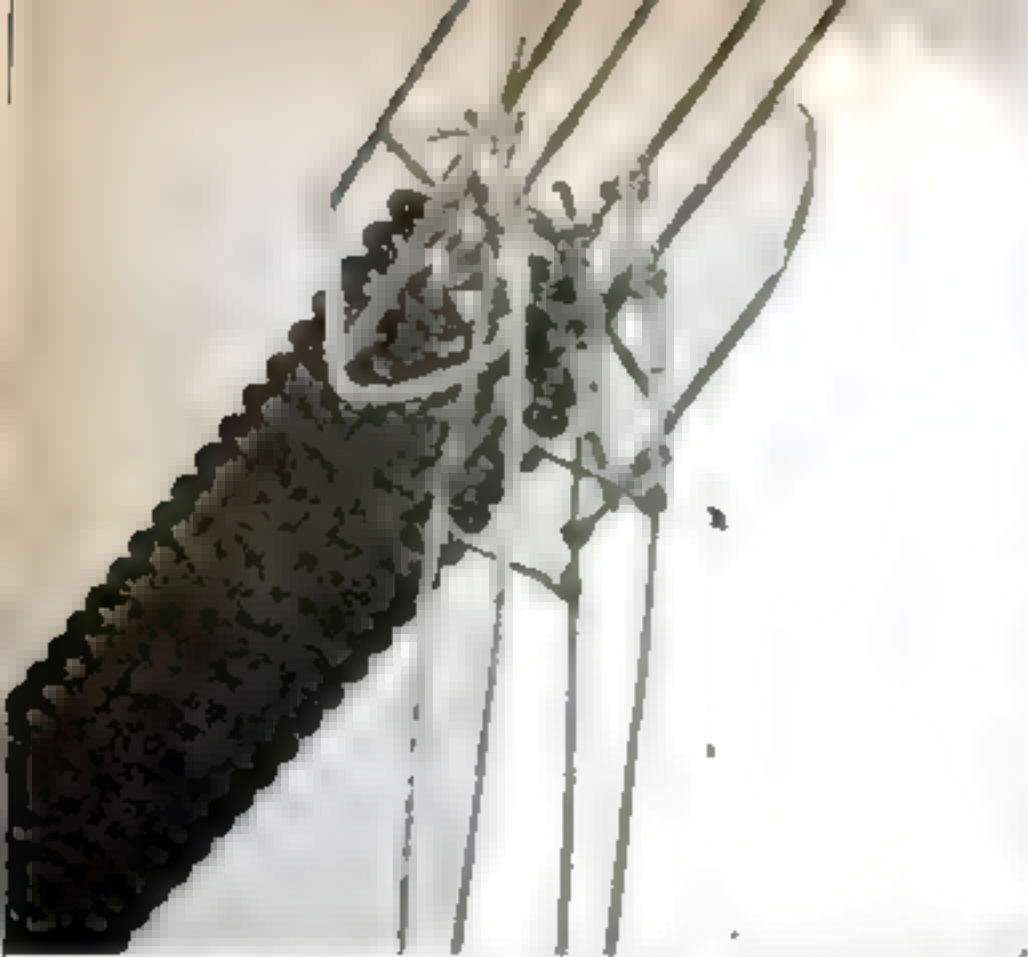
The spectacular exhibition marked the opening last December of the world's highest-voltage transmission line. A 4½-mile experimental one, through rural countryside in the Berkshire hills, it will be operated by General Electric at up to an awesome ¾ million volts.

It will pace a phenomenal series of

.....
WORLD'S HIGHEST-VOLTAGE power transformer, fed from conventional 115,000-volt transmission line, steps up voltage to as high as ¾ million volts for General Electric's EHV line.



CONTINUED



FOR 750,000 VOLTS, this "cage" of four 1.19-inch wires will form a single conductor on GE's EHV line. Photo also shows its dumbbell-shaped spacers, corona shield, insulators.

leaps in power-line voltage, taking place all over the globe. Up to 1952 the world record was 287,000 volts. Since then, 345,000 volts has come into use on 2,500 miles of U.S. lines—and, only last year, 460,000 volts, on a 13-mile stretch of the Pennsylvania Electric Co. system between Claysburg and Saxton, Pa. Meantime, abroad, the record has successively reached 380,000, 400,000, 500,000 volts. Now, both here and overseas, engineers are preparing to go higher.

Why? Because only extra-high voltage, EHV for short, can bring you the torrent of electricity you're demanding—and keep down your bill for it.

America's appetite for kilowatts is

doubling every 10 years. More and bigger power stations can generate them. Getting them to you is the rub.

Build more power lines? A right-of-way comes high today, if it can be got at all. And there isn't enough geography in the country for as many lines as will soon be needed—if they operate at 22,000 to 138,000 volts, as most of our transmission lines still do.

Here's where EHV, meaning 275,000 volts and up, comes in. For it enormously multiplies the power that can travel by an existing route.

Doubling a line's voltage pushes twice as many amperes of current through, and quadruples the power delivered—which equals volts times amperes. The power goes up, as an engineer puts it, about in proportion to the square of the voltage. A 287,000-volt line carries more power than four of 138,000 volts; a 750,000-volt line, more power than 29 of them.

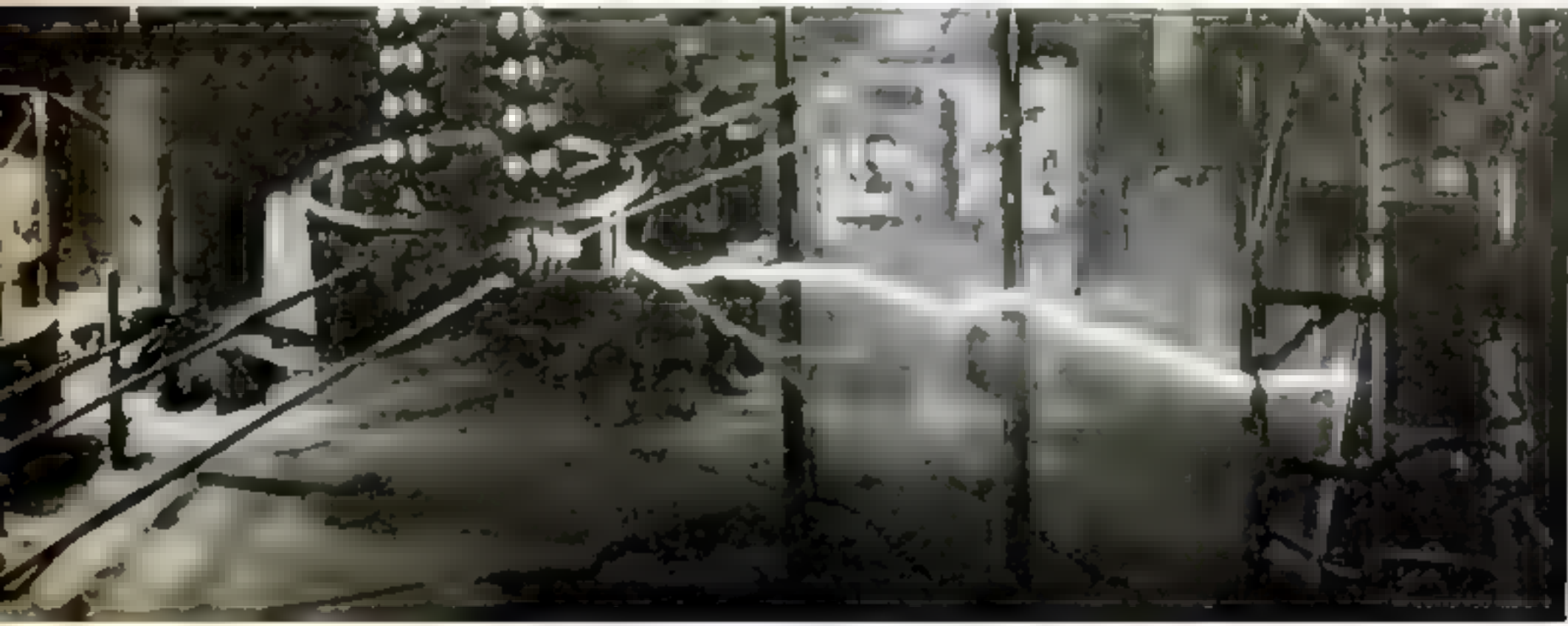
And EHV brings power from afar with less loss. That's important abroad, where coal is expensive and power comes from remote hydro plants—and is becoming so here, too, as engineers look farther from cities for generating sites.

Three widely spaced wires make a single EHV line or "circuit." That's the number it takes to carry three-phase alternating current, standard for power lines. Transformers step up voltage at the transmitting end, step it down at the receiving end. So far, in principle, a hot line's like any other. But when you see the real thing . . .

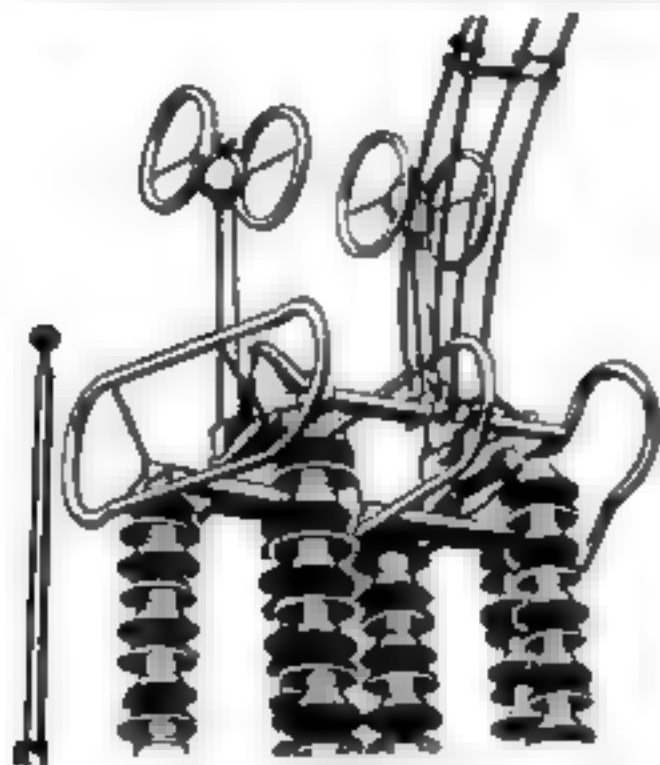
First impressions of GE's new line are breathtaking. Switches with 17½-foot gaps have blades like flagpoles. Bridge-

FIERY ARC whams from full-size section of GE line to simulated tower, in high-voltage-lab trial. To avert such a 'flashover' and short circuit to

ground, actual line provides huge 15-foot air gap as clearance between wire and tower—after allowing for wire's sway in wind.



Glimpses into the strange new world of extra-high voltage



RINGS, SPHERES, AND WAVY LOOPS, like these on giant switches of GE line, enclose sharp-cornered EHV hardware to bar escape of electricity in hissing, glowing corona discharge.



RAINDROPS on EHV wire produce corona. From their sharply curved bumps, electricity escapes more easily than from wire's flatter-curved surface.

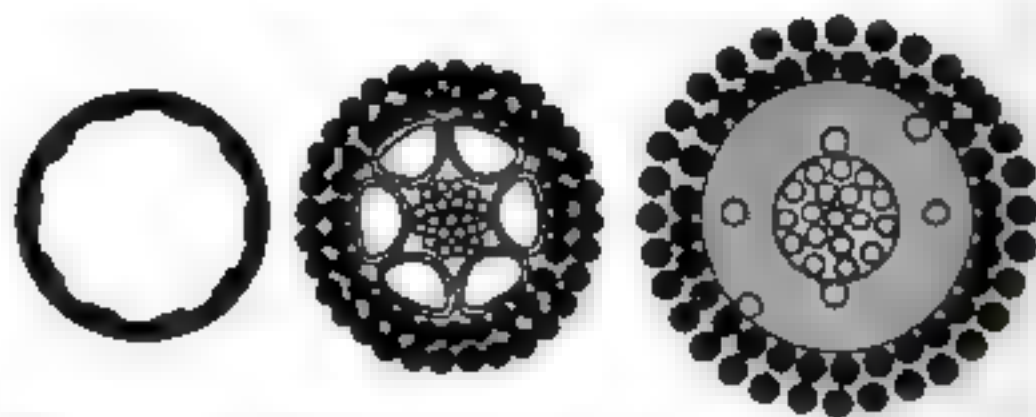


WIRES THRASH ABOUT, wrap themselves around each other as shown, from magnetic force of short-circuit current of thousands of amperes.

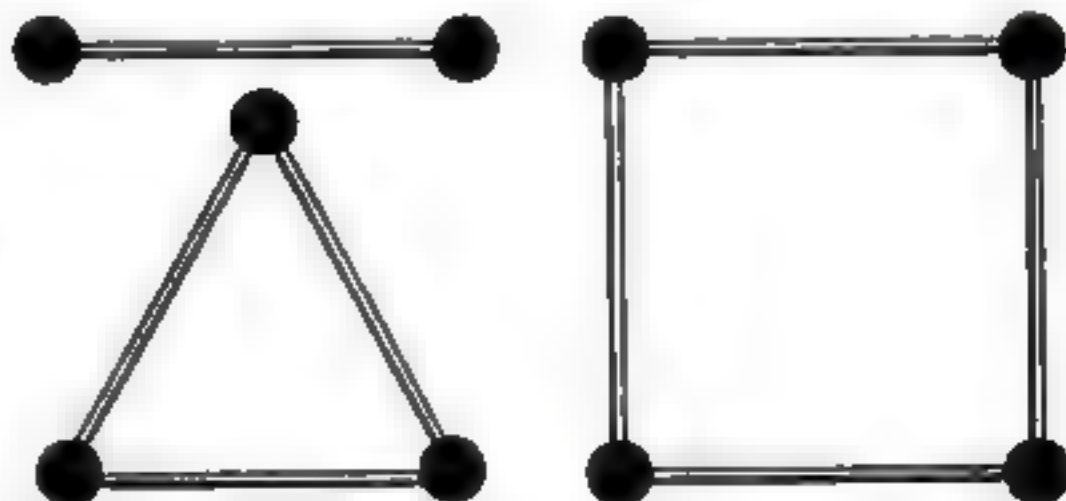
like towers extend up to 128 feet high and 182 feet wide, and one has a passenger elevator. Insulators 15 feet tall suspend the wires—and what wires!

World's biggest wire. A wrist-thick, 2.32-inch giant, rated to carry more than 1,500 amperes, is the world's biggest wire for power lines. It was recently custom-made by the Aluminum Company of America in two styles. One is being tried out on GE's new line, the other on Penellec's 460,000-volt line.

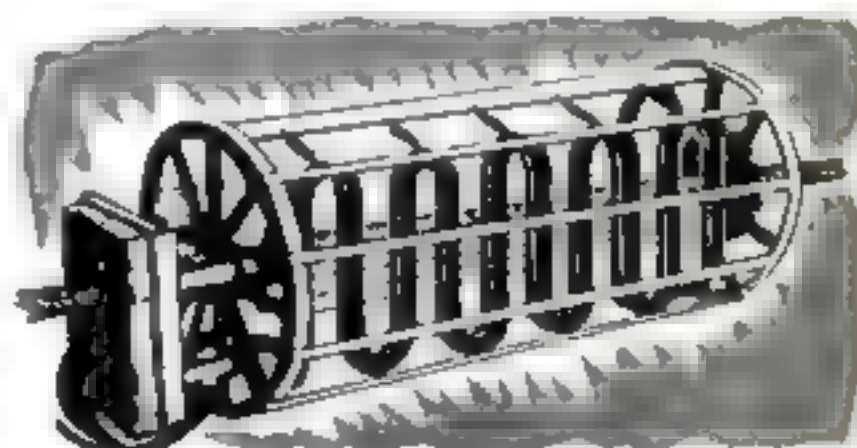
More than bigness, though, sets hot lines apart. As voltage mounts, electricity behaves in strange new ways.



"PIPES" MAKE WIRES for EHV—since current flows near outside of big conductors. Examples, left to right, are 1.4-inch copper tube, and "expanded" aluminum wires of 1.75-inch all-metal and 2.32-inch paper-filled types.



"CAGES" OF WIRES will serve for still higher voltages. Shown in endwise views are arrangements of two, three, and four wires in new multiple or "bundle" conductors.

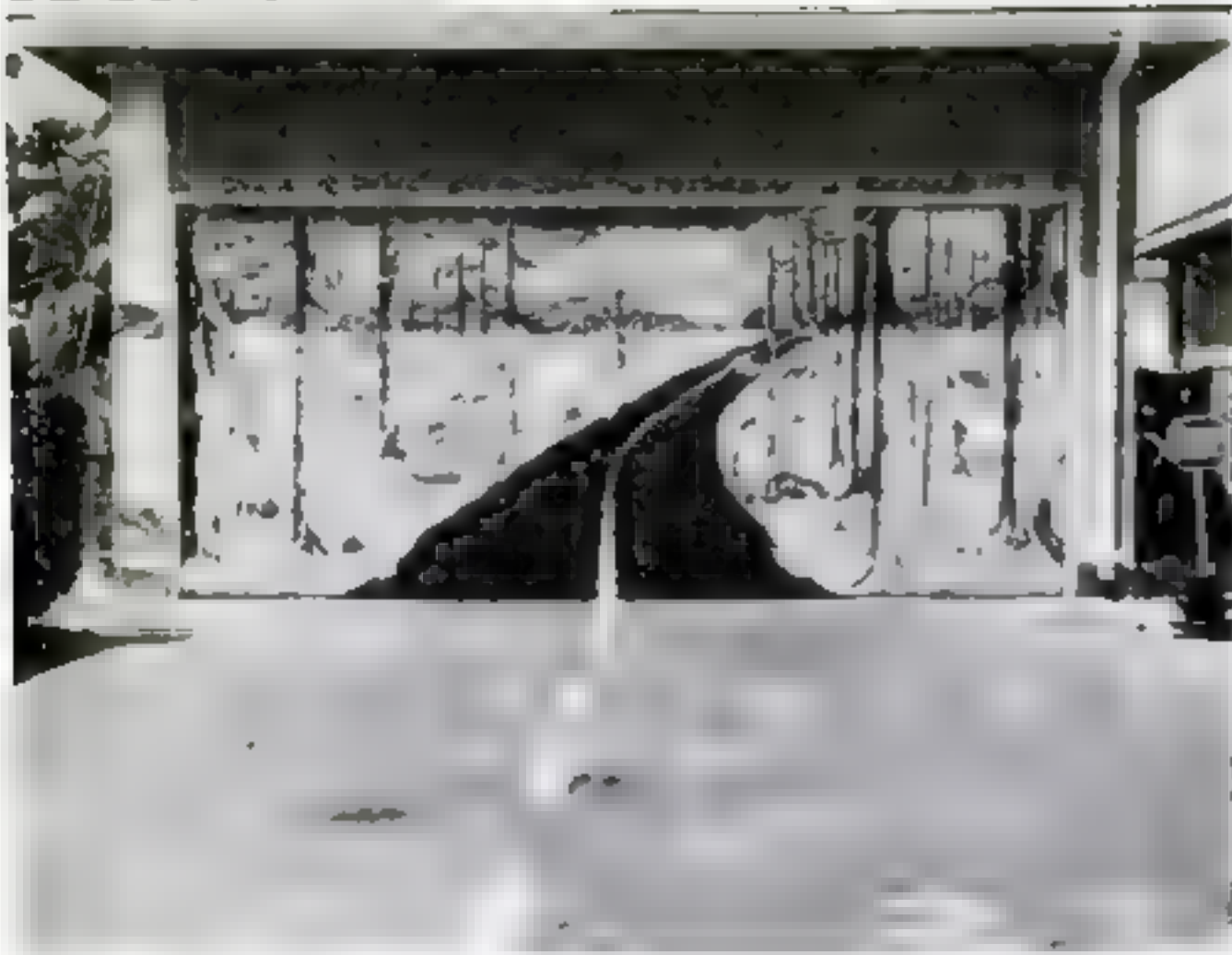


WIRELESS LIGHT, for airplane-warning beacon, needs no connection when hung on high-voltage line. Electromagnetic induction lights it up.

Enter corona—the hissing, glowing escape of electricity at voltage so high as to break down the insulating barrier of the air. Beautiful but unwanted, it plays hob with radio and TV reception. And it wastes power—sometimes, at worst, half the amount fed into a line.

It streams most readily from sharp prominences: nuts, bolts, plates of EHV hardware. Surrounding them with gently curving surfaces thwarts its escape. So fanciful-looking ornaments—spheres, rings, wavy loops of gleaming aluminum—adorn GE's line. Called corona shields,

[Continued on page 236]



Double-take garage door

Don't try driving into the landscape shown at left. The scene, with a forest-bordered road, is a mural painted on the garage door.

At a safe distance from it are Stop signs. The artist-owner is Jack Gustavson, who lives in Long Beach, Calif.

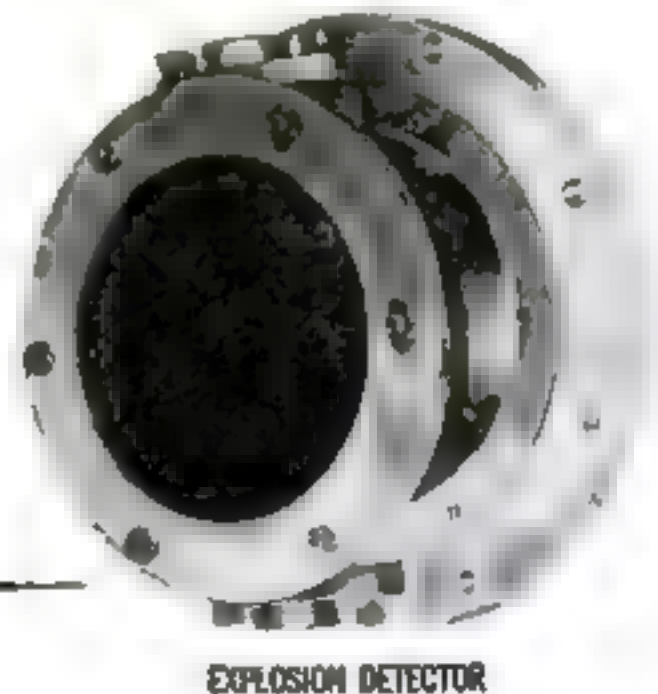
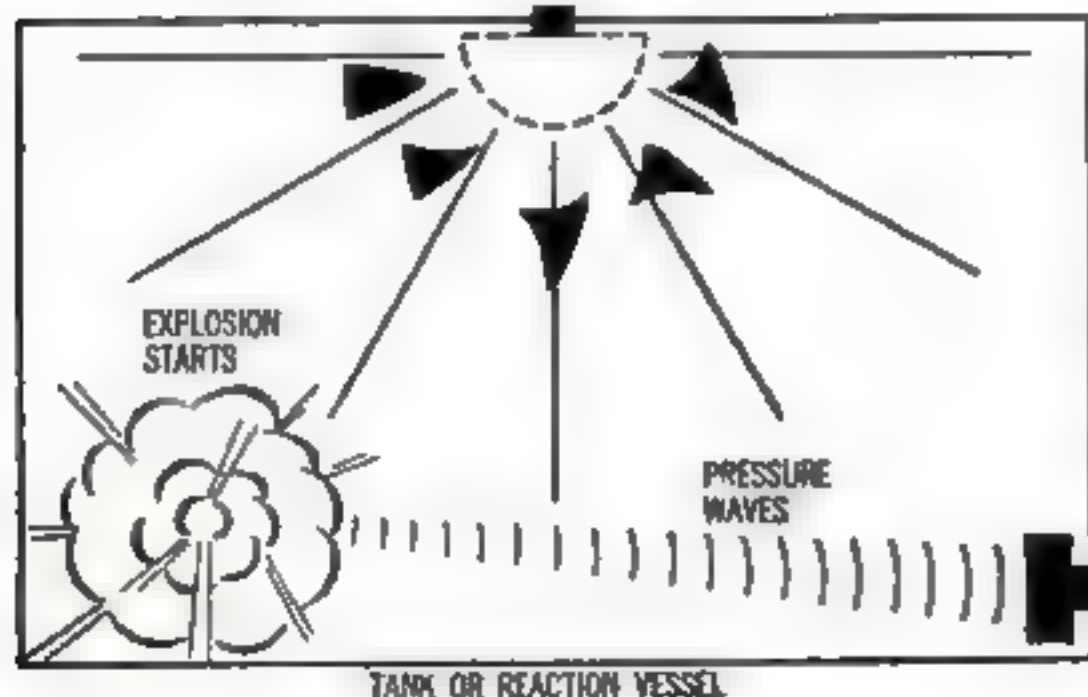
He wasn't nearly finished when he did the door. He painted animals on his fence, an ocean scene on his house, and, inside, jungle scenes.

This extinguisher puts out an explosion

By performing the astonishing feat of stopping an explosion after it has begun, a new safety aid is saving lives and averting costly havoc in U. S. industrial plants. Introduced by Fenwick, Inc., of Ashland, Mass., the automatic device

stands guard over a chemical tank or a grinding mill. It incorporates two principal elements:

A detector, responsive to pressure rise or to radiation, instantly senses the onset of a blast. Electrically this triggers the bursting, by a small charge, of a liquid-filled metal hemisphere called a "suppressor." Flying apart in petal-shaped fragments, the suppressor sprays the whole enclosure with a mist of water or of bromochloromethane, a highly volatile fluid. Applied at the critical moment, the cooling effect of the evaporating mist halts the explosion and kills it before damage is done. Replacing the expended suppressor element is all that is needed to put the protected equipment and its electronic guardian against explosion back into service.



A NEW HOBBY:

Restoring Antique Radios

FINDING and restoring a classic radio can be an exciting and satisfying excursion into yesterday for those who remember the "good old days" of battery sets. To those too young to remember the time before radios plugged into a wall socket, it promises a new experience and a lot of fun.

I recently came across an old Crosley model 52. Recovered from an attic thick with dust and memories, it presented a challenge. Could this old-timer be made to work again? I set about finding out.

This radio, at a guess, was made about 1923 or 1924. It's a three-tube job (type Ol-A)—regenerative detector and two stages of audio. It uses the ancient book-type tuning condenser,

TUNING IN ON THE OLD DAYS: You'll be surprised how much less cranky the old sets are than you remember them. Stations are putting out a much stronger, clearer signal now.

**By
Herbert Y. Moon**



tapped inductance, and variable coupling regeneration control. The rheostats varying the filament voltages serve as sensitivity and volume controls. All binding posts for batteries, aerial, and ground connections are on the front panel. This placement of the binding posts marks it as a *real* old-timer. Later, they started to hide such things in the rear of the set.

Speaking up. The speakers of the period were the separate high-impedance type. A modern low-impedance speaker can be used only by adapting it to the job with an output transformer. Of course, headphones can be used interchangeably with the old speakers, and were often necessary for the weak, distant signals that were so eagerly sought by DX hounds.

Since the triode circuits are simple, and the power supply external, these early sets are easy to repair. This particular specimen had been retired for nothing more than an open filament rheostat. But radio was developing fast in those days, and a new improved model had probably just come out, anyway.

Dry cells will provide the filament power in a pinch, in place of the rechargeable storage battery once generally used. Many sets used a trickle charger to keep up the battery, and had a relay in the filament circuit to switch on the charger as the set was turned off. Forty-five-volt B batteries were the plate high voltage, and a 4½-volt C battery supplied the necessary negative bias.

It wasn't long before somebody invented the B Eliminator, which plugged in the wall socket and replaced the B batteries. An A Eliminator also came on the market later. As I recall, it weighed about 30 pounds and was essentially a well-filtered battery charger with a variable output. With both of these units in use, you had an all-electric set. No more embarrassments such as a battery failure during the Dempsey-Tunney championship fight. (I can remember that as a major tragedy.)

Remember the old long-wire antennas you made as long and as high as your real estate would permit? A good antenna and ground were needed because the sensitivity of these early sets was pretty low. I hadn't had an outdoor antenna for 20 years, but I jury-rigged one for use with my antique.



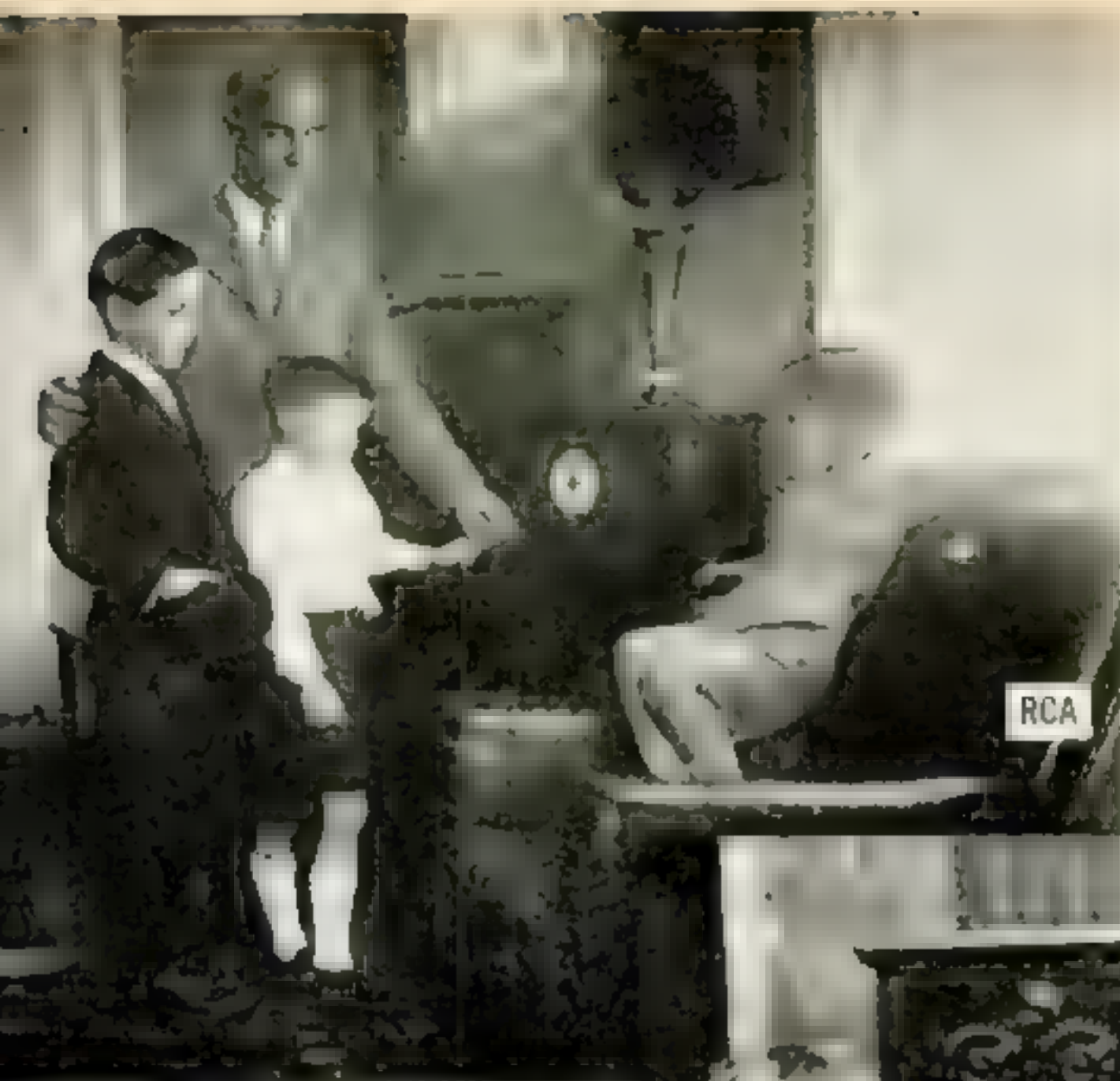
I turned on the switch and the tubes lit up like light bulbs, just as they used to. I tuned in a whistle, backed off the regeneration to get rid of the squeal, and there was a burst of rock and roll. Not that I had expected Vincent Lopez or the Happiness Boys, but—oh, well.

Memories. When you get one of these old classics going, you are surprised to find that it works much better than it used to. Radio stations put out a much stronger and cleaner signal than they did back in the twenties. And, of course, programming is really under control now. Remember how the announcer used to say, "Please stand by," and then leave you with dead air for several minutes?

Reactivating this old classic was a rewarding experience, and one that I can heartily recommend. There are a lot of these old sets still packed away somewhere. Have you looked in that dark corner of the attic lately? Poke around behind that dusty trunk beside the stack of Caruso records—there may be an old Atwater Kent or Freed-Eisemann waiting for you, eager to help you tune in some good old memories.

An album of radio sets from the twenties

SOME OF THE BEAUTIES you may uncover in your search are shown here. Pride of ownership ran high with these old sets. Families posed proudly with them, and silent-screen stars favored them for publicity shots. Multiplicity of knobs and dials, along with the number of tubes, became status symbols. Later the trend reversed and set makers began bragging about their "one-dial tuning."



ATWATER KENT



FEDERAL

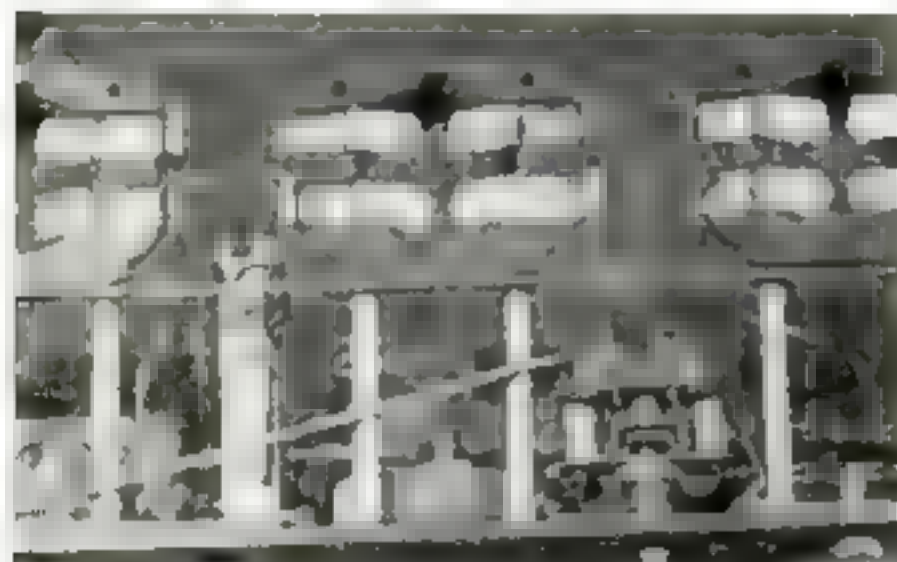


FREED EISMANN

CONTINUED



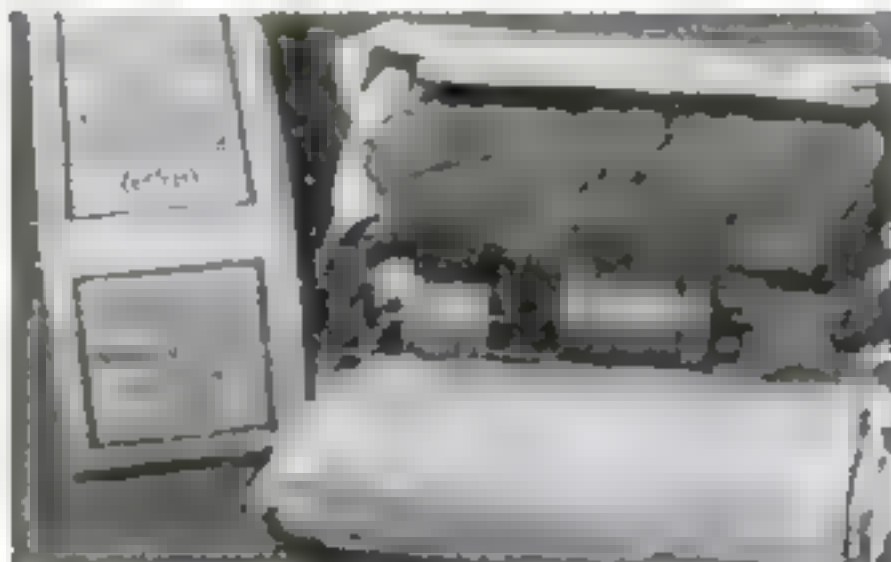
ORDERLY, LOW-RESISTANCE WIRING was a passion with designers. That's a #14 bus bar.



VIEW FROM BENEATH the tube sockets shows a simplicity of wiring long since vanished.



SPIDERY THING on the left is a vario-coupler; to the right is a book-type tuning capacitor.



TUBE PACKAGING protected it as if it were a rare old vase. Type 201-A served all purposes.

Tips for Fixing Old Radio Sets

Finding tubes for these old-timers—if you need them—may be a challenge to your detective ability. Manufacturers have long since discontinued making them. A canvass of long-established local dealers may produce results if you can persuade one to rummage around in the dusty corners of his stockroom. Junk yards and secondhand shops are another possibility. Or your best bet may be to look up some of the amateurs or repairmen who were in business way back when. Many of those early-day radio bugs never throw anything away.

Of course, if you're knowledgeable, modern battery tubes could be used by replacing tube sockets and altering circuit values, but this would be roughly equal to putting a V-8 engine in a Stutz Bearcat.

Most sets of the era used a type 01-A tube. This was a general-purpose triode used in every position in the set. It requires 5 volts DC on the filaments with 45 volts on the plate when used as a detector, or 135 volts as an amplifier. Grid-leak bias for a detector was usually obtained with a 2-to-3-megohm resistor shunted by about a .00025-mf.

capacitor. As an amplifier, the negative grid bias should be about 9 volts.

Parts other than tubes should cause no trouble. Fixed resistors and capacitors can be replaced with the modern equivalents. Rheostats, tuning capacitors, vario-couplers, RF coils, etc., were built sturdily. They're not likely to cause trouble, but if a fault is traced to one of these, it can usually be fixed by an obvious mechanical repair.

Unfortunately, early speakers were electrically fragile. Few seem to have survived in operating condition. The old horn-type magnetic-diaphragm speakers were the toughest. The later paper-cone, balanced-armature types gave a better tone but were not so rugged. Plate voltage to the final amplifier tube flowed through the winding of these high-impedance speakers. The speaker impedance was the direct load for the tube. Modern speakers cannot be connected directly to the speaker binding posts, but will work if an output transformer matching 8,000 to 10,000 ohms to your speaker voice-coil impedance is used. You can connect high-impedance magnetic earphones directly.



Short Cuts and Tips

FROM PS READERS

FLATTEN RIM BEAD BEFORE CUTTING



CUT ON HEAVY LINES!
BEND ON DOTTED LINES

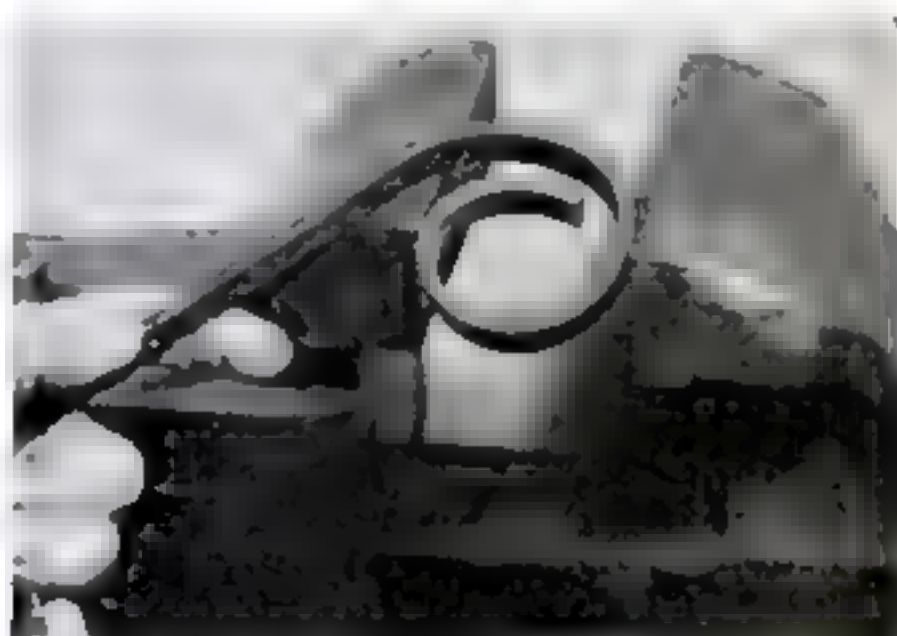
Handy Tray Sorts by Size

SPOUTS of various widths, formed by cutting and bending the rim of a metal serving tray, make quick work of sorting a large number of small parts by size. —William H. Carhart, Fort Lauderdale, Fla.



Two-Way Coat Hanger

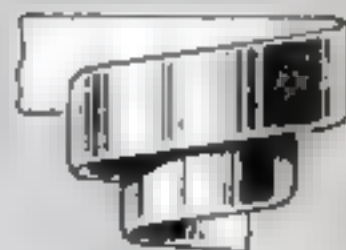
ARE you the fussy type who likes his clothes in the closet all facing in one direction? With this double-hook arrangement, you'll never have to take a coat off the hanger to turn it around. Snip the hook from another hanger and twist it on, as shown. This also makes it easy to lift the hanger from a crowded pole. —Robert Micals, Freehold, N.J.



FLAT SPIRAL



HELIX



Shaping Wrought-Iron Spiral

AFTER you've bent a flat spiral at the end of a bar of wrought iron, you may want to reshape the inner turns. The easiest way to get at them is to convert the spiral into a helix, so you can grasp individual turns in a vise, as above—or strike them with a hammer. After final shaping, you can squeeze the spiral flat again. —Walter E. Burton, Akron, Ohio.

Short Cuts and Tips

FROM PS READERS

Truck Carrier for Long Stock

A LENGTH of sheet-metal ventilation duct bolted under the roof of a service truck makes a handy compartment for carrying tubing, rods, molding, and other long materials. An opening should be cut at the rear of the roof to let the duct extend about an inch. Materials can then be put in or taken out without using the truck doors. Install an eyebolt



on either side of the duct so the ends of the materials can be tied down.—*Charles H. Hardy, Whittier, Calif.*

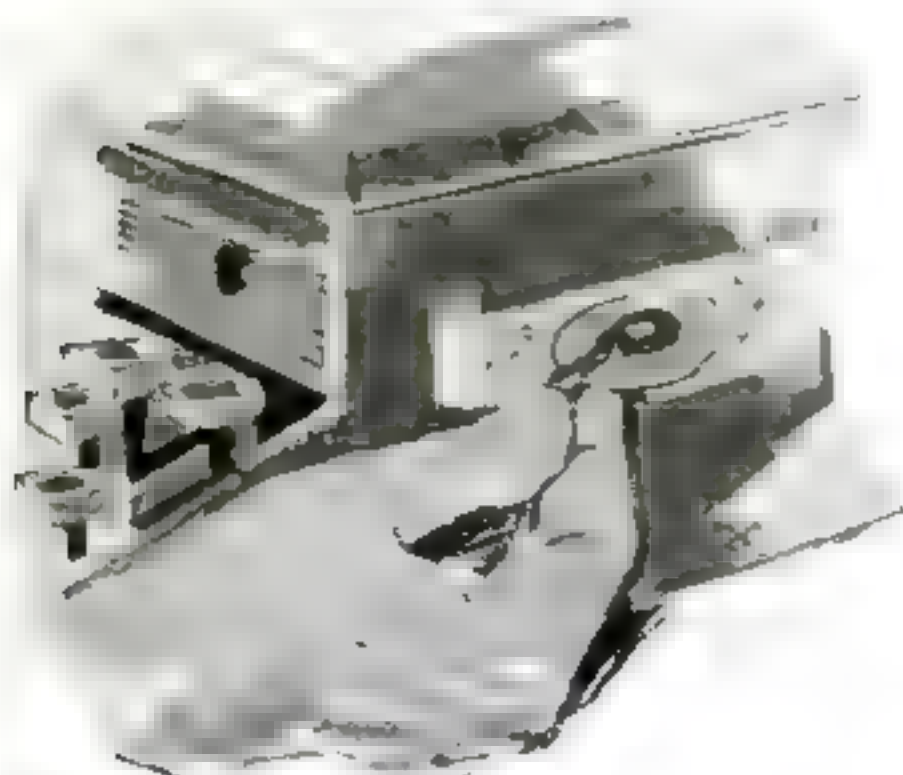


Bracket Does Double Duty

THE bracket at left, beneath a high shelf, provides hooks for coat hangers. It's made of two wrought-iron scrolls riveted together.—*Walter E. Burton, Akron, Ohio.*

Pad for Bicycle Kick Stands

DO BIKE riders in your family scuff their shoes on the kick stand? Slip on a section of rubber hose (right); let it extend about $\frac{1}{4}$ " beyond the end.—*Harry Wheeler, Toledo, Ohio.*



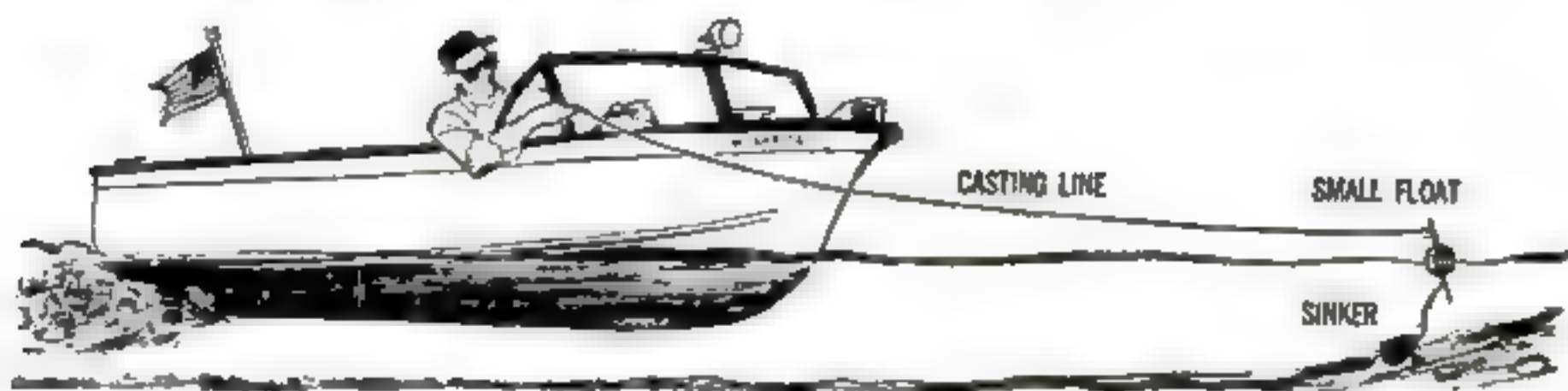
►►►OUR electric clothes dryer gets temperamental. Sometimes it won't heat up, even though the drum revolves. I could never check while it was running, so I installed a signal light—like the one in our oven. I cut the prod ends off a 50-cent neon tester and extended the wires to attach to heating-element terminals.—*Charles W. Adams, Arvida, Quebec.*

Sandpaper Cleans Dirty Eraser

You can keep your typewriter eraser clean and fast-working by wiping it occasionally over a piece of fine sandpaper taped to the side of the machine as at left.—*D. O. Van Gilder, Denver.*

Boating Hints

By Herb Pfister



Weighted Casting Line Sounds Depth

A DEPTH-SOUNDING line thrown out well ahead of the boat is safer than sounding with a pole at the bow.

You can make such a line by tying a heavy sinker to a small float with a line about six inches *longer* than the draft of your boat. It's simple but it works.

▶▶▶EPOXY paint that's left over after finishing your hull can be saved for several days by storing it in the refrigerator. Wrap the can in a plastic bag to seal in paint odors.

As you proceed slowly, throw the float and sinker ahead. If the sinker pulls the float under, the water is deep enough to navigate. If the float remains on the surface, it indicates that the sinker is resting on the bottom in water too shallow for your boat.

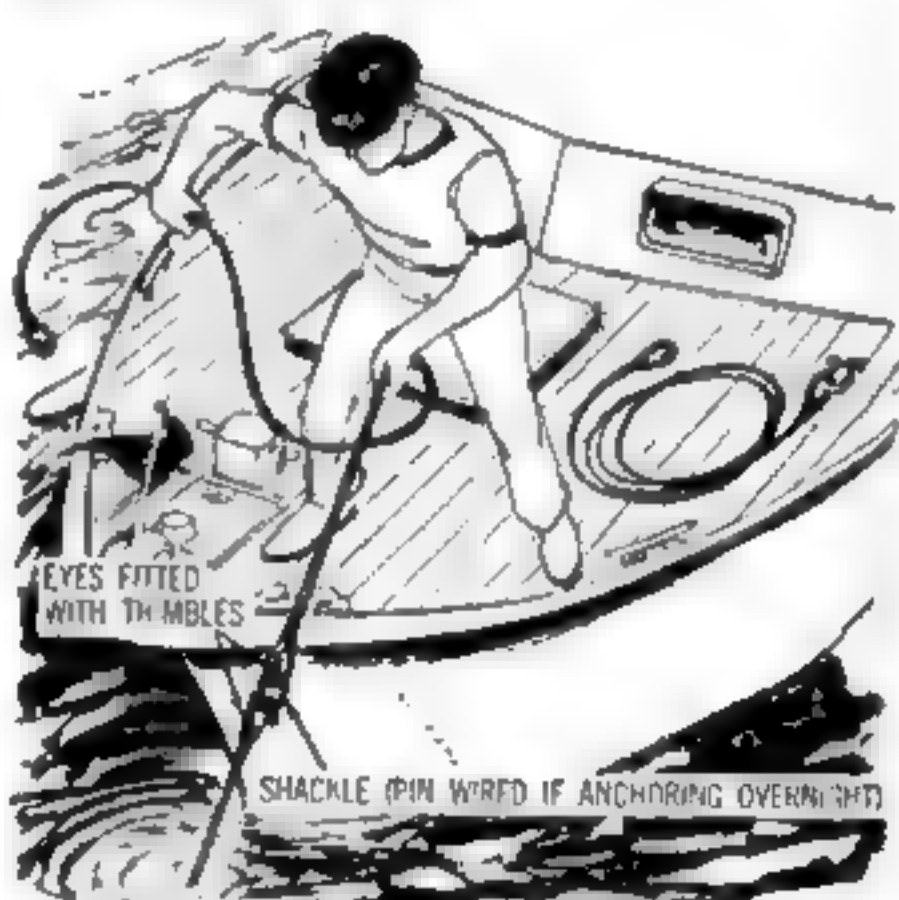
This otherwise wasted paint is valuable for touching up thin spots after the finish dries, or for applying a second coat to points of wear, such as the stem, chine strips, or keel.



Starting a Flooded Outboard

IF FIVE or six yanks on the starter cord won't kick over your motor, chances are you've flooded it.

An easy way to unload the excess gas is to turn over the motor with the throttle fully open (just as you start a flooded car engine). Most outboards must be in gear to open the throttle wide, so tie the boat to a dock, or anchor and take up slack, to keep from lurching forward when the engine starts.



Subdivide Your Anchor Line

A LONG anchor line is easier to handle if you divide it into two or three sections and splice an eye on both ends of each part.

In shallow water offshore, you might need only one section to drop anchor. The others can remain coiled and dry.

Out in the deep, you can shackle the other lengths to the original section until the line is long enough to provide the required scope for the depth.



The ABCs of Crow Hunting

By John S. Flannery

CROW hunting, one of America's finest off-season shooting sports, is often overlooked by outdoorsmen. The basics are a shotgun, shells with Number 6 or 8 shot, a crow call, and a handful of easy-to-make decoys.

Assuming you have shotgun and shells, the big step is purchasing a call. Try before you buy. Don't worry about not knowing how to blow it. Simply puff on the thing (cup it tightly with a closed hand if you don't want to alarm the other customers) and see if it will require a great deal of air to produce a loud noise. If it does, look for a model that can be blown easily. You'll appreciate it when calling a whole afternoon or an entire

day. This takes a lot more wind than you might suspect.

Making your own decoys. Get three or four cardboard boxes from a grocery store, preferably double weight and 18" by 24" or larger. These will be used for the bodies of six to a dozen decoys. Also buy a spray can of flat-black enamel.

Rough out the profile of a crow with a soft pencil. Simply sketch a tapered body with a rounded breast, a short neck extending up and forward, a head and beak. A few hunters prefer oversize decoys, claiming they are more conspicuous. After you drop the first crow, whether through luck or skill, a better proportioned template can be made by outlining the bird on cardboard or newspaper.

Cut out the first decoy with a sharp

knife or razor blade. Use this model to outline others. When possible have the cardboard corrugations running vertically; this will make it easier to insert a wire stand. Cut out a half-dozen or more silhouettes.

Snip 10" to 14" lengths from the cross-bars of wire hangers. Force a wire up through the center of each decoy, beginning at a point on the underside just behind the back curve of the breast.

Holding the silhouette by the wire leg, spray or brush one side with the paint. Turn and paint the reverse side and edges. If the wire is shiny, give it a coat as well. Generally a second coat of paint is not necessary. The cardboard soaks up an abnormal amount of paint, however.

Learning "crow talk." Calling is the second important part of the crow-hunting game. Read the directions enclosed with your crow call. Then spend a few hours in crow territory watching and listening. It won't take long to recognize basic calls. Three short *caws* announce "danger." Don't use it if you want shooting.

"Come here" boils down to a series of three or four drawn-out *caws*—sort of a Southern drawl with a growl mixed in. Practice making a *g-r-r-r-r-r* sound in the back of your throat. Then make it as you blow the call. Get a friend to learn the "agony" call (a pathetic squall) and your duet will insure success.

Always attempt to locate crows by sight or by sound before setting up decoys. Find cover in head-high trees or bushes, preferably near a hilltop. Set decoys in trees, on posts, and even on the ground. Scatter them as far out as 50 yards, placing a few in close to your shooting position.

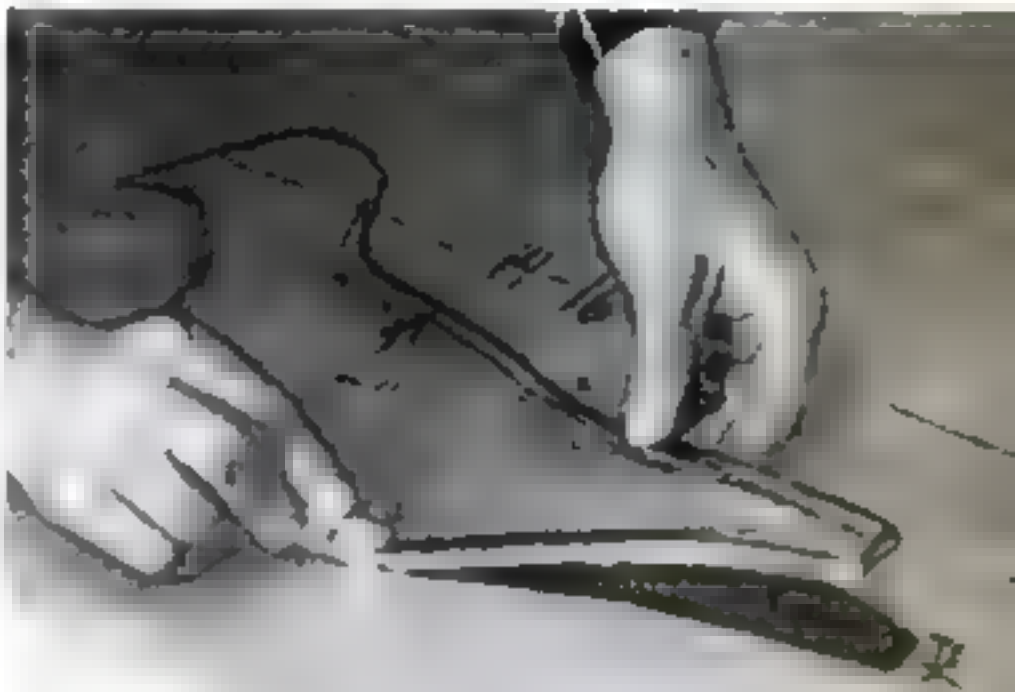
Call sparingly, making your first call the old reliable "come here." Wait a few minutes, then wait more. Frequently a scout will wing in silently, take a look at the layout, then scat back for his buddies. Let him go. When the flock comes, talk their language. After the birds begin milling over your decoys, try to imitate everything they say. If one gives the alarm call, drown him out with "agony" or a loud drawled call.

Try to stay in shadows and under cover, and avoid looking up or moving until the time is right. Then call, shoot, and get your quarry.

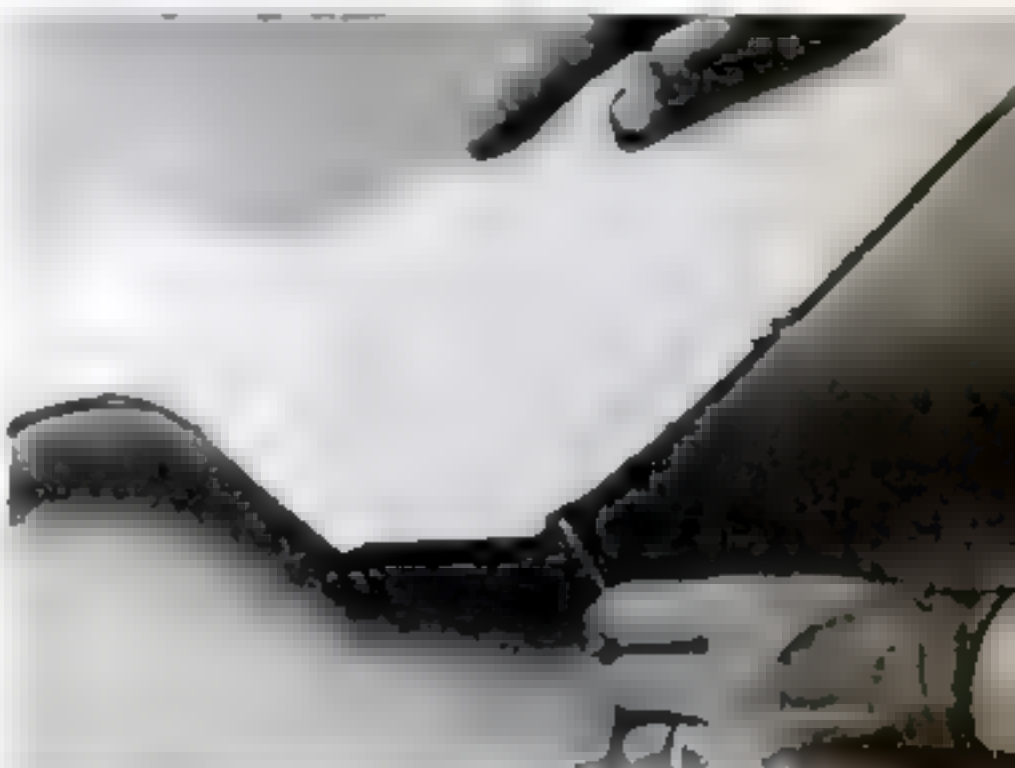
How to make decoys



SKETCH CROW PROFILE on grocery-carton cardboard to the dimensions shown. You don't have to be an artist. The crows aren't fussy.



CUT OUT THE BIRD with razor blade or sharp knife. Then use this as template to lay out and cut out half a dozen more silhouettes.



THRUST COAT-HANGER LEG UP through the corrugated board. A piece about 12" long is fine. Spray-paint the decoys with flat-black enamel.

HOW TO BUILD A MODEL **Air-Cooled Hot-Air Engine**



By Harry Walton

JUST 15 seconds after you light up, this little engine chugs into action. It will keep going as long as it has fuel—at a lively 1,000 r.p.m. running light, or plugging away hard under any load short of stalling it.

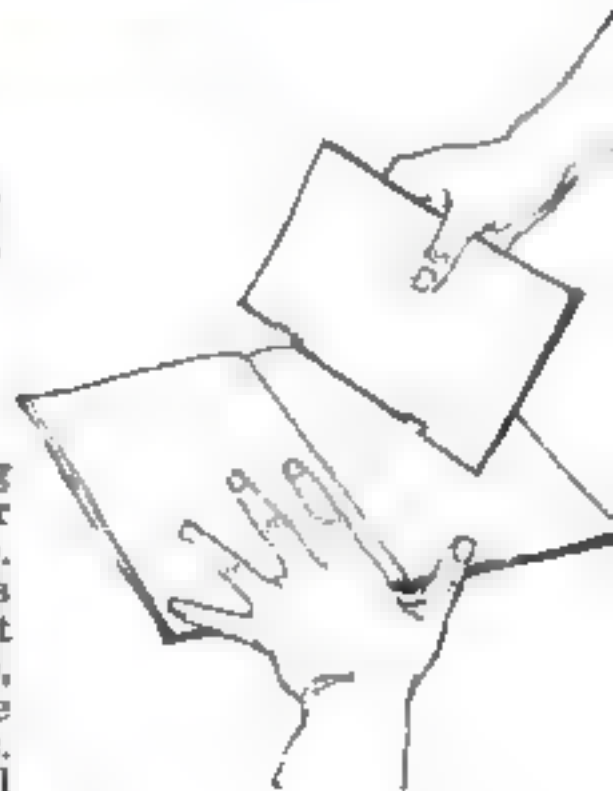
You'll fire it up to mystify friends or just to see it go. Its rocker-arm action is fascinating to watch.

Dating back to 1816, the hot-air engine is also one of the latest subjects of research. It could be fueled by nuclear heat, and a highly sophisticated design, to be powered by solar heat, is proposed for generating electricity aboard space satellites.

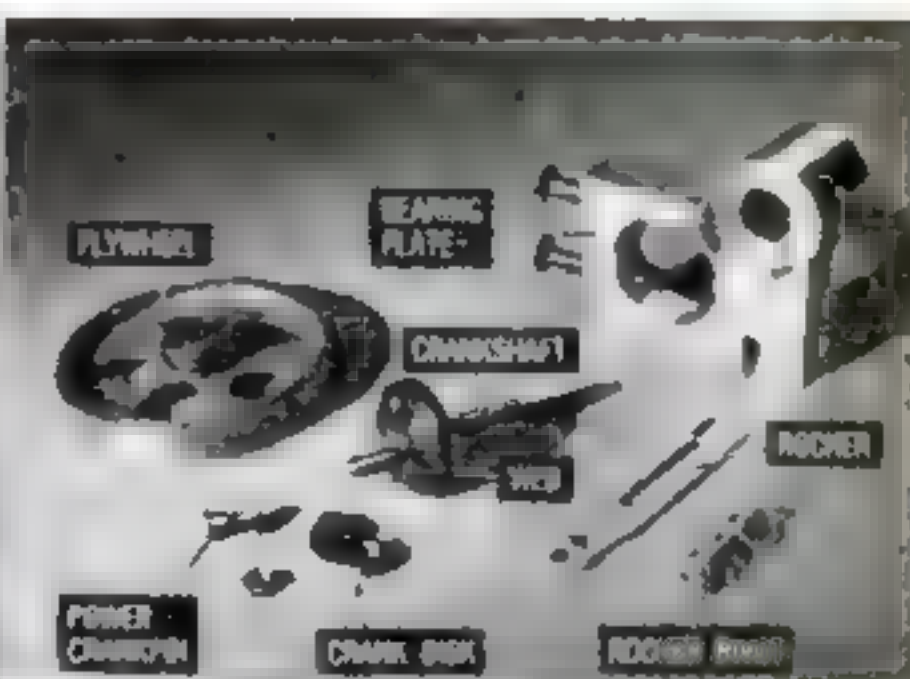
This simple one, fueled by alcohol, will drive small models, pump water, spin a display turntable, or turn a fan. It requires no castings, and involves some interesting but not difficult lathe work. Fun to build and operate, it's a conversation piece for your den or workshop, or a safe but exciting gift for any youngster who can be trusted with matches.

A FREE PS Save-It Blueprint

Save the following four pages for your personal project file. Pinch the blue sheets together, gently lift from the magazine, and tear them loose from the two staples. The blueprint will then lie flat for use.



Steps in machining the parts for the air-cooled hot-air engine



ALTHOUGH not hard to build, this engine won't forgive bad workmanship. Mechanical freedom and airtightness are essential. It should both turn easily and bounce back against compression. Metallic auto-body putty, thinned with lacquer thinner, should be used on all joints to seal against pinhole leaks.

The frame. This is two pieces of $\frac{1}{2}$ " dural bolted together. Lay out the cylinder standard first. Transfer the center of the upper (displacer) recess to the opposite face by drilling it through No. 60

In the four-jaw chuck, first center the lower (power-cylinder) recess. Bore it $\frac{1}{4}$ " deep and .044" smaller than the outside cylinder diameter; then thread it 40 threads per inch. Reverse the work with the displacer recess centered. Bore this also undersize by double the thread depth, and $\frac{1}{8}$ " deep. It will overlap and break through the other recess, the hole forming the transfer port.

If your lathe doesn't cut threads, both recesses may be smooth-bored, the cylinders turned to push fits, and seated with auto-body putty

With the standard still chucked, drill and countersink for the $\frac{1}{4}$ "-20 brass bolt that forms the gland. Insert the bolt with a smear of sealer under its head, and tighten a nut on the other side. Do not remove the piece from the chuck to do this; unscrew the chuck from the lathe if necessary.

Remount it to centerdrill the bolt head. Run a No. 43 drill through. Follow with a new No. 42 or a $\frac{3}{32}$ " reamer to make

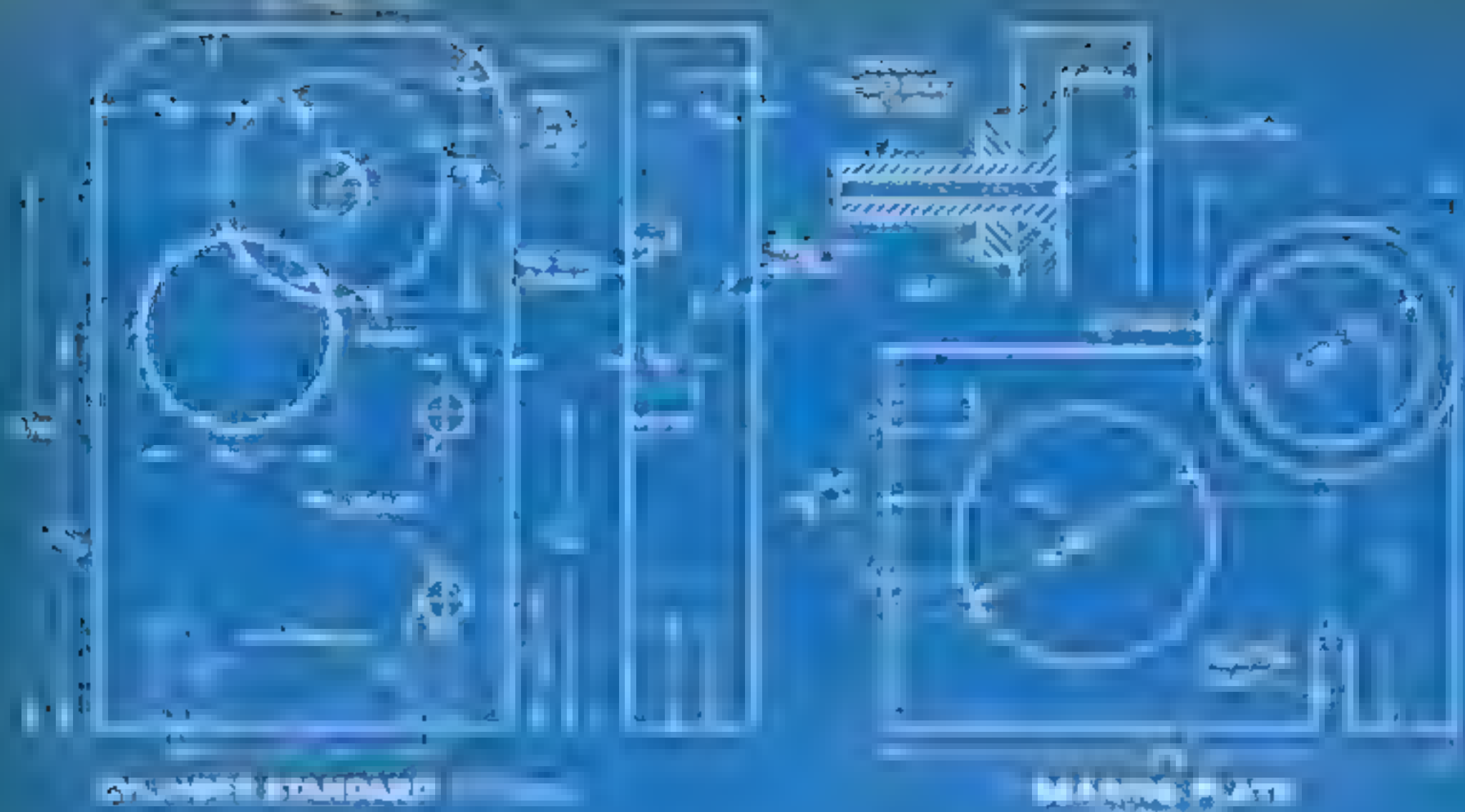
a free-sliding, absolutely shakeless fit for the displacer-piston rod. A reamer can be made from a piece of the rod stock by filing a long flat taper on it and stoning the flat smooth.

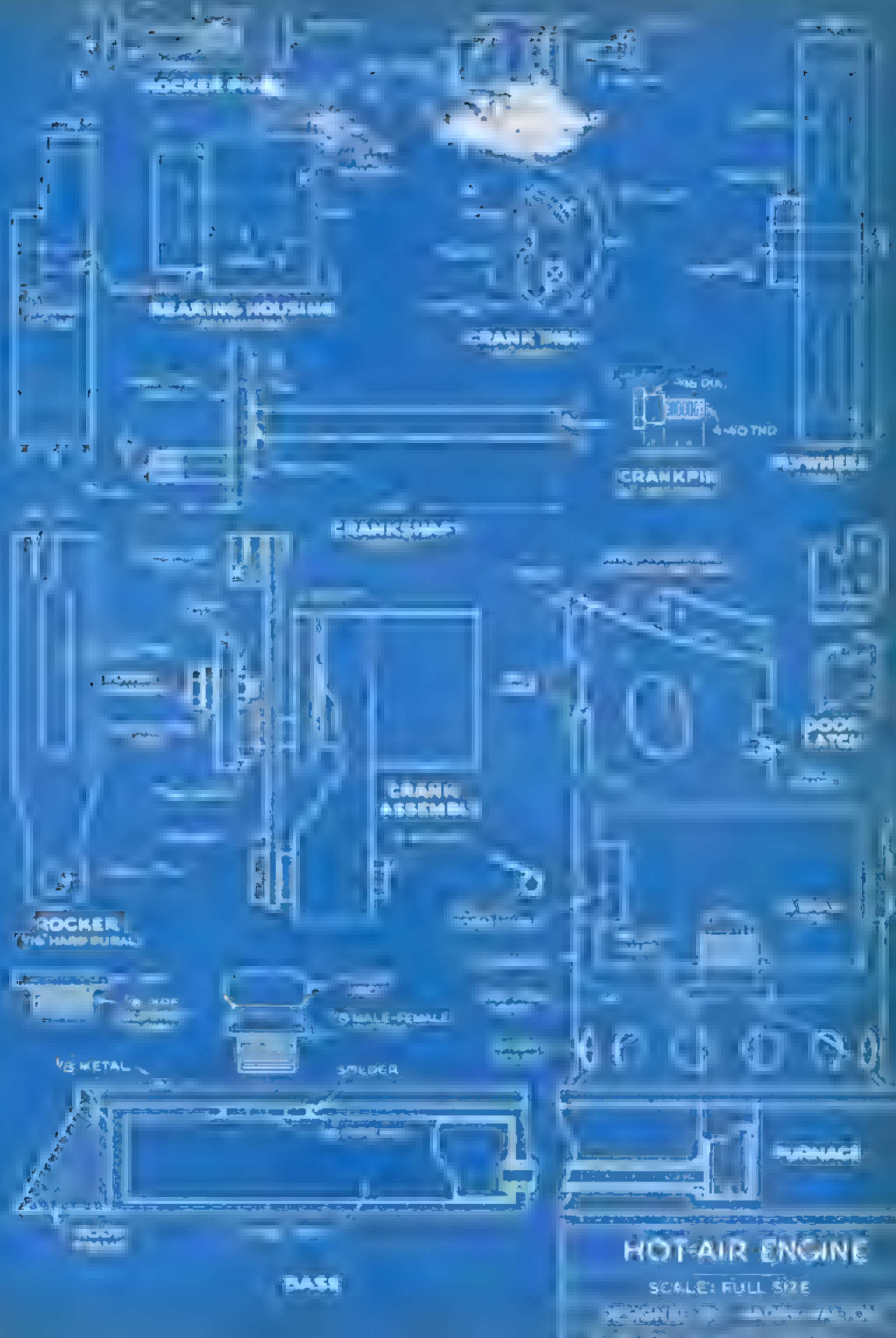
Bearing plate and housing. Clamp the plate to the standard with bottom and side flush. Spot holes to be tapped by running a drill through those in the standard. In the lathe, turn out the $\frac{1}{8}$ " deep step or shoulder; then bore through to $\frac{3}{4}$ " diameter. The 1" hole is for appearance only, and optional. Saw and file the top radius to shape and the slot in line with the bearing center.

For the bearing housing, chuck 1" aluminum and turn the shoulder to a press fit in the plate. Drill the through hole; then bore for the inboard ball bearing. Reverse the piece, centering it carefully, and bore the seat for the outboard bearing. If you prefer a plain brass or bronze sleeve bearing, drill an oil hole after pressing it in. Press the housing carefully into the bearing plate so that the shoulder seats squarely. Do not push in the ball bearings as yet.

Displacer cylinder and piston. As air must be alternately heated and cooled in the cylinder at every revolution, it must be thin-walled. Twist 1" steel conduit onto a tight fitting arbor centerdrilled for tailstock support. Turn the outside to leave a wall about .010" thick up to $\frac{1}{4}$ " of one end. Thread this end to fit the recess and cut to $3\frac{1}{2}$ " length.

Silver-solder or braze a domed copper cap into the unthreaded end. Test for air





ROCKER PIN

BEARING HOUSING

CRANK SHAFT

1 1/2" DIA.
1 1/2" DIA.
4-40 TND

CRANK PIN

PISTON

CRANK SHAFT

CRANK ASSEMBLY

ROCK LATCH

ROCKER
(1/16" HARD BRASS)

1/8" MALE-FEMALE

1/8" METAL

SOLDER

BASE

HOT-AIR ENGINE

SCALE: FULL SIZE

leaks by blowing into the other end with the joint under water.

The displacer piston must be light, airtight, and a loose fit to let air flow around it. An aluminum cigar tube is the right size and has a domed end.

Chuck a piece of aluminum bar; turn to $\frac{3}{16}$ ", centerdrill, and tap for the rod. Recess the end to lighten it; then turn a $\frac{1}{4}$ " length to a close push fit for the tube with a shallow groove at the end of it. Push the tube on to run true. Feed a round-nose tool, mounted upside down, against the groove to spin the edge of the tubing in. Apply a coat of sealer around the spun joint.

Thread the displacer rod in the lathe to insure getting the threads square (a die held against a tailstock pad will do). Smear a little sealer on the threads before screwing the rod in.

Power cylinder and piston. A bronze bearing bushing makes a good cylinder. Lap the inside smooth, if necessary, with fine abrasive cloth in a slotted dowel. Thread one end to fit the recess, and chamfer the bore at the other for insertion of the piston.

Bore out the inside of the power piston, then twist onto an arbor. Turn the outside to a virtually airtight fit in the cylinder. Final fitting may be done by honing with a fine stone, abrasive cloth on a metal block, or a split lap. Lightly oiled, the piston should strongly resist being pulled out of the cylinder when the other end is held shut. Pushed in, the piston should act as if there is a spring behind it, rebounding vigorously against compression, and hold this air cushion for several seconds.

Insert the displacer rod and mount both cylinders. The displacer must slide full length without rubbing. Submerge the assembly in water past the gland. Pushing in the power piston will cause bubbles to reveal any air leaks. Only one or two slow bubbles from around the displacer rod are permissible.

Crankshaft and crank assembly. Turn a narrow thrust shoulder on the web and drill to a press fit on the shaft. Make sure the main crankpin is absolutely parallel to the shaft. Drive the inboard ball bearing on the shaft, insert it in the housing, and press the outer bearing into place.

Always apply driving pressure to the race being seated, not through the balls.

Now you're ready for the crank assembly. Adjust displacer stroke by moving the rocker pivot up or down in the slot; fix the rocker head to move the displacer full length without hitting at either end. Screw on the crank disk, locking it, by the jam nut, concentric with the crank web. The engine shown runs clockwise as seen from the crank end; to reverse rotation, turn the crank disk over. Push the power crankpin through the con rod and tighten its nut at the center of the slot.

Cooling fins. These are necessary for steady running. They can be cut from sheet aluminum with a fly cutter, then chucked and bored to an interference fit on the cylinder. Lay them on a plate heated by a torch or stove burner (not too high, or the aluminum will melt). Pick up a hot fin with pliers, quickly slide it into position, and let it cool.

Base and lamp. Frame a metal plate with $\frac{3}{4}$ "-high strips of wood or metal channel. Mount the engine with two $\frac{1}{8}$ " bolts screwed into the standard. A shallow fuel tank may be soldered up of tinplate. A tube carries alcohol to the burner, a piece of $\frac{1}{8}$ " pipe ($\frac{3}{8}$ " o.d.) with wicking. Add a wire-screen grate for burning matchsticks or charcoal.

Furnace. A taper-necked beverage can makes a good one. Punch a hole in the domed bottom for the wick tube. Cut an opening for the displacer cylinder and a fire door as shown. Drill air holes around the bottom.

Flywheel. This should be of moderate weight and of a size to clear the base, but is otherwise not critical. It may have a pulley for a spring belt.

Timing. The crankpin slot permits shifting the power stroke slightly to both sides of its normal 90-degree position behind the displacer stroke. To check timing, run the engine and then blow out the flame. Running should continue with an even beat on both in and out strokes, right down to a tick-over.

If the engine doesn't run, check for binding and air leaks. Sometimes a leaky displacer piston is at fault. Remove it from the engine and plunge it into very hot water. Bubbles will show leaks.

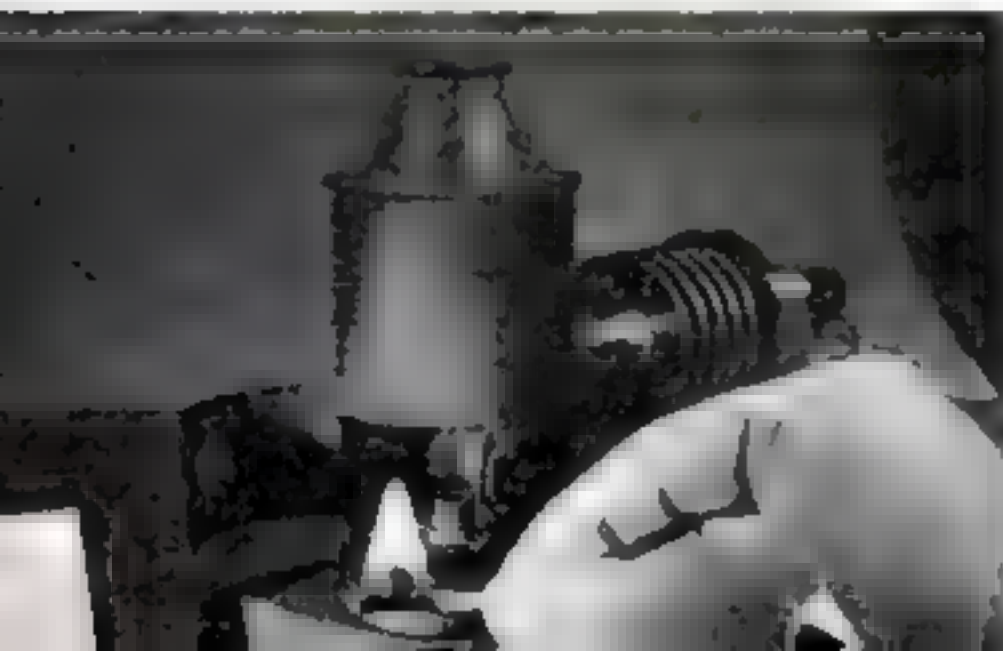


BORE CYLINDER STANDARD from both sides, the power-cylinder recess first. The recess for the displacer cylinder breaks through as above, leaving an open port between the cylinders. Be sure to drill and ream the displacer-rod gland (arrow) at the same chucking.



TURN STEEL CONDUIT on an arbor to make the thin-walled displacer cylinder. A short end section (left of toolpost) is left thick and threaded to screw into the cylinder standard

HINGED FIREDOOR has a mica window. Alcohol is the best fuel, but a fly-screen grate makes it possible to burn wood. Engine starts cold, runs half a minute on three paper matches.



Pointed Hoe Lays Drain Tile

A GARDEN tool can save your back and hands when laying drain tile. Insert a pointed hoe blade in one end and lower the tile into position in the trench. Use the same tool to dig a bed for the tile along the trench's bottom, and to tap the tile into alignment as it's laid.—*John Harvey Versteeg, Inkster, Mich.*

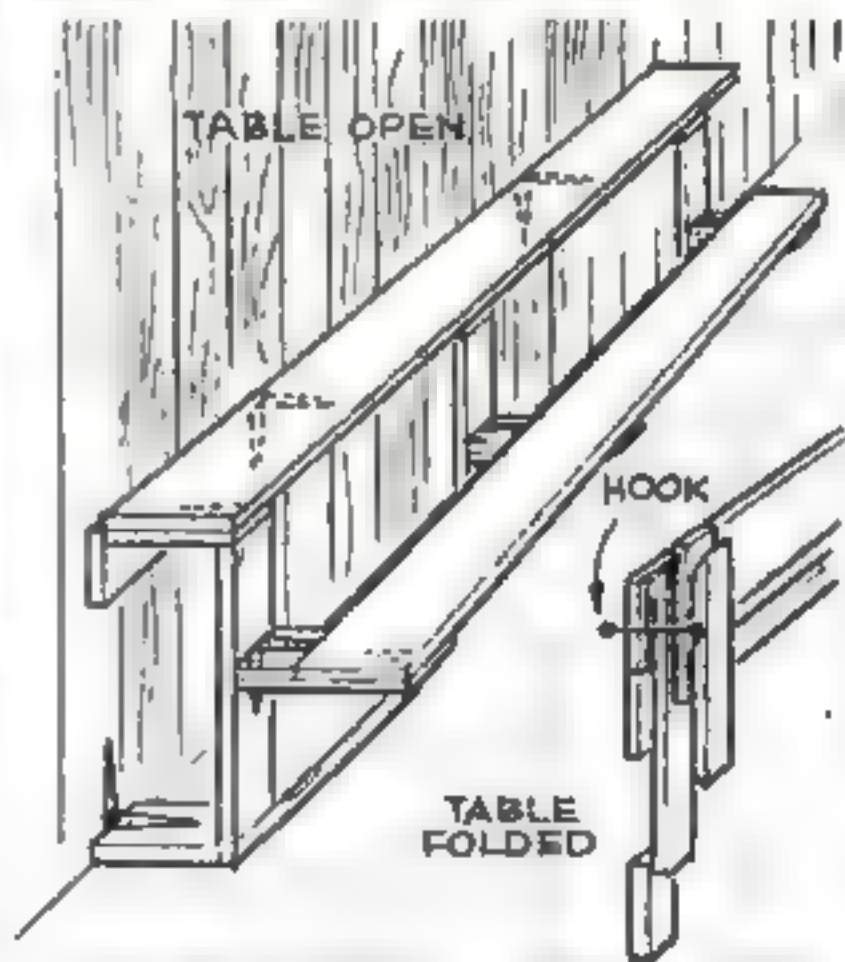
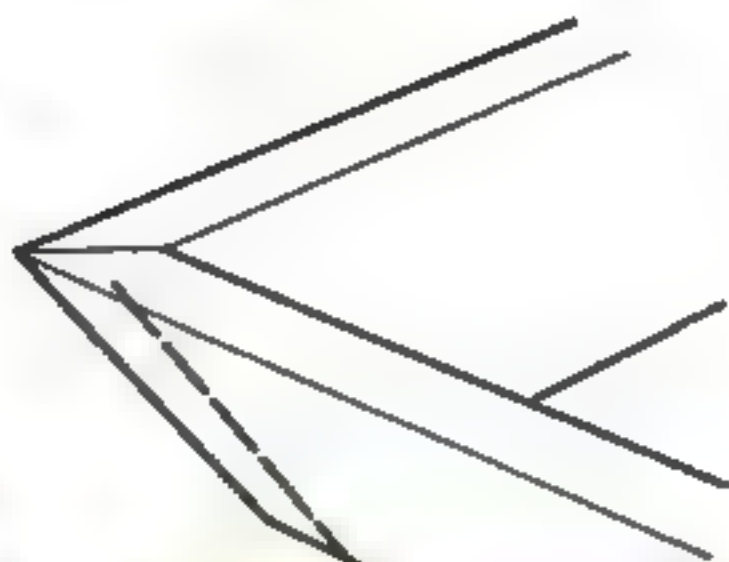
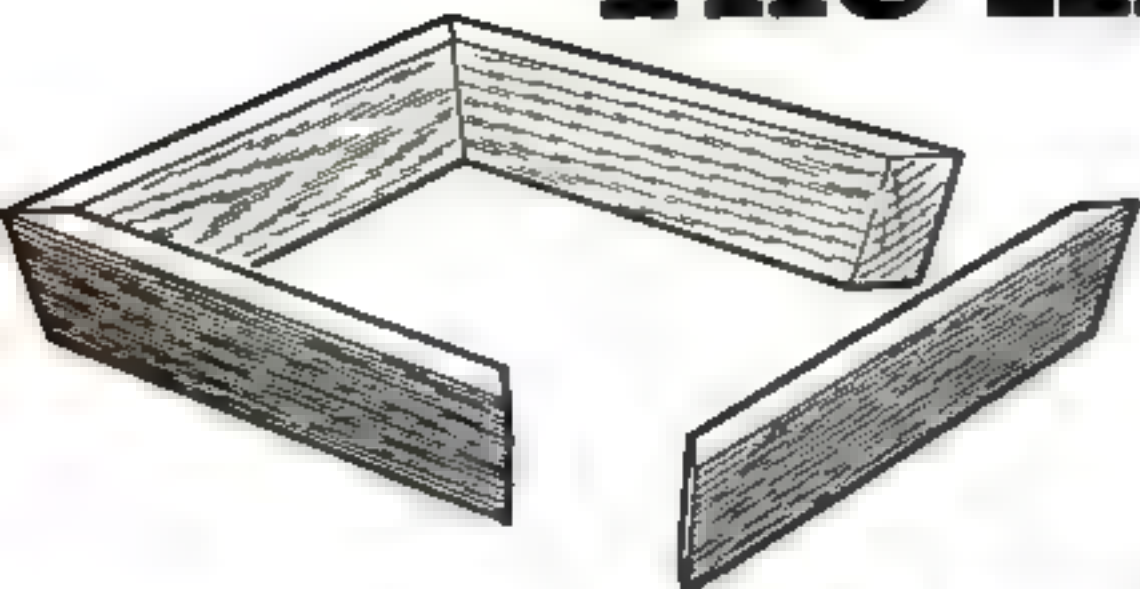


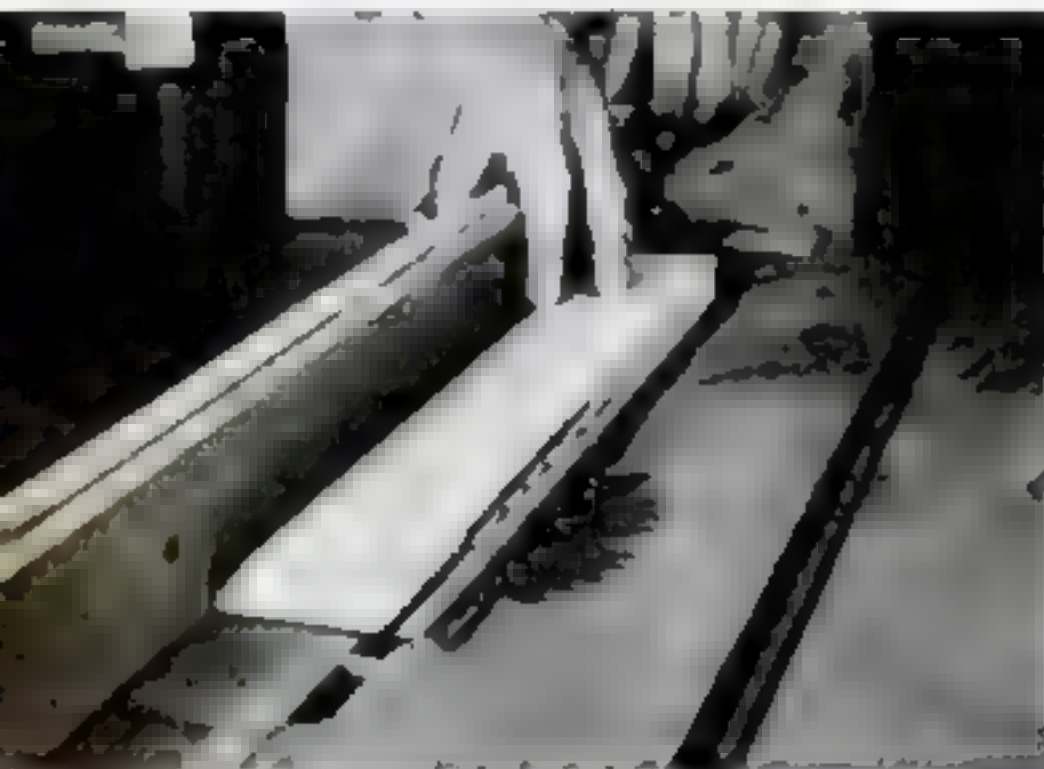
Table Folds Up Against Wall

THIS folding table-and-bench combination, made of 1" stock and two-by-fours, serves workmen at Tahquamenon Falls State Park, Mich. Hooked to a house wall, it might serve for outdoor meals or as a potting bench. Folded flat, it would take little space from a patio.—*Art Lauren, Tahquamenon Falls, Mich.*

The Know-How



How to cut compound angles offhand



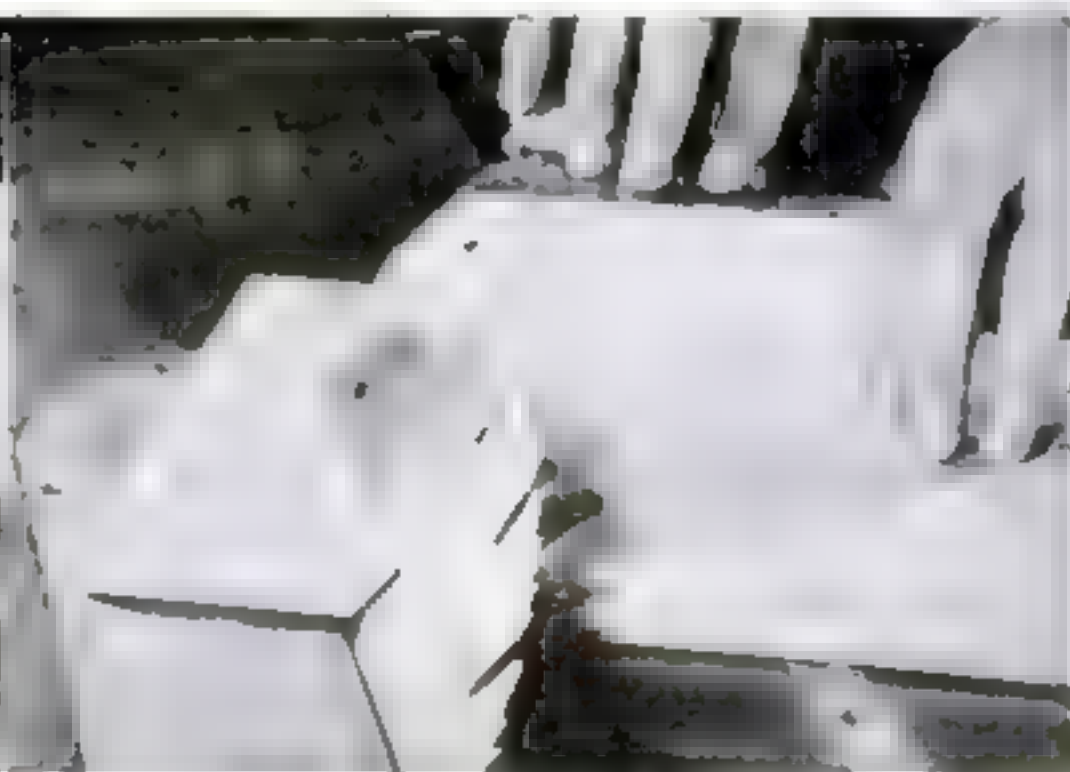
1 FREEHAND METHOD works directly for relatively narrow stock such as you might use for picture frames. First bevel stock to give slope angle desired. Exact angle is unimportant since this method will automatically make an accurate joint with any slope you choose.



2 SET BLADE TILT TO ZERO and miter gauge to 45 degrees—just as for an ordinary flat miter cut. Hold the work firmly against the miter gauge with the beveled surface flat on the table. Slope angle and blade cutting depth will determine how wide a piece you can handle.



3 FOR WIDER STOCK, make a gauge for setting angles. Use method in top photos to make a sample cut on a piece of scrap stock. With stock flat on table and point of cut face touching blade, adjust blade and miter gauge until side of blade rests flush against sample.



4 WITH WORK FLAT ON TABLE, you can now make compound-angle cut regardless of width of work. Close-fitting joint is assured without math or chart. Inaccuracies inherent in setting to odd-degree markings are avoided. Mark angles on gauge block and save for future use.

You Need for Compound Angles

By R. J. De Cristoforo

UNLESS you've been briefed on compound angles, there's no table-saw experience more baffling than your first try at a shadow-box picture frame or a taper-sided planter box.

The conventional cutting method requires a blade tilt plus a miter-gauge setting. The two settings must mesh perfectly to give the required slope angle to the sides and a 90-degree turn at the corner. Most woodworking handbooks have a chart that gives these settings for selected angles. But knowing the theoretically correct angles is only a start. It's the cut-and-try preliminaries to finding the precise settings that throw you.

Rarely can you just set the adjustments to scale readings and produce an accurate joint. Making corrections is complicated by the fact that the two settings interact.

By eliminating one of the required settings, you can reduce confusion and minimize a critical factor of one machine calibration.

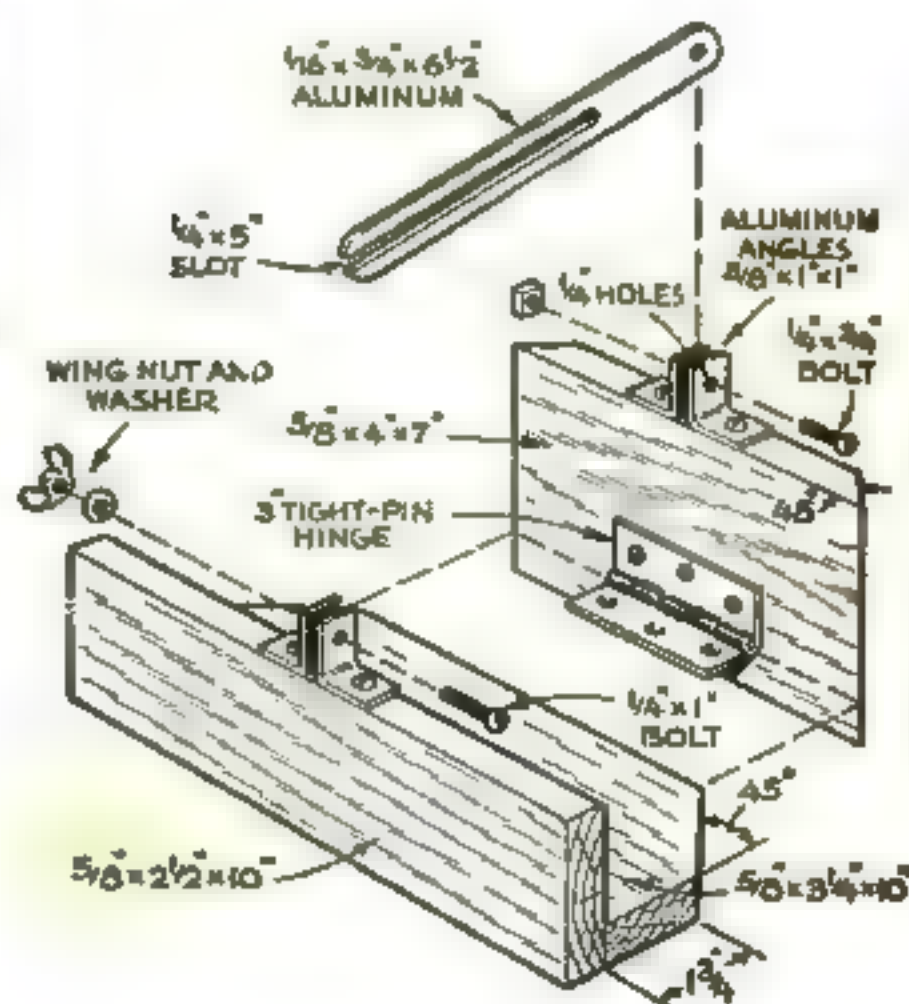
Here are a couple of tricks that will save endless cut-and-try time on spur-of-the-moment jobs, and two simple jigs that will yield close-fitting joints time after time once they are set up accurately. No charts are needed and you can pick any work-slope angle you want. Choose it by eye or measure it accurately—the joints will always fit.

CONTINUED



How to make a tilt jig for your miter gauge

MITER-GAUGE JIG eliminates the creep problem, insures greater accuracy and speed, lets you omit the edge bevel if desired. It can be locked in any tilt position to give positive support for the work at correct slope angle and assure identical cuts when you switch from right to left miters.



How to make hopper-joint frames with any number of sides

SLOPE ANGLE OF THE WORK does not affect the miter-gauge setting when you use the method shown here. Tilt work to the desired slope and set the gauge to half the included angle between sides.



How splines can improve your hopper joints



SPLINES will strengthen joints and make them easier to assemble. A miter-gauge V jig will help you cut the necessary grooves quickly and accurately. Mark jig to locate cuts. Face bevel forward and make pass with stock pointing to the right. Point mating piece to the left.



MAKE A JIG of two strips of wood nailed to a plywood base to form a right angle so you can squeeze parts together when gluing. Splines, cut so the grain runs across the angle, should fit snugly enough to hold parts securely. After glue dries, trim splines and sand smooth.

How to make a sliding-table miter jig for your table saw

Cut the platform from $\frac{1}{4}$ " plywood to minimize loss of blade projection. Cut two strips from well-seasoned hardwood and dress to slide smoothly in the saw-table slots. Set these guides in the saw-table slots, run a bead of glue down the center of each, and place the platform on top so that its edges are parallel to the guides. Clamp in place and drive four or five $\frac{1}{2}$ " nails through the plywood into the strips. After the glue sets, cut the saw slot to about 10" short of the edge of the platform.

Check the miter guide with a square when you shape it and do not attach it permanently until you've tack-nailed it in place and made a few trial cuts. Check your sample cuts to make sure they are exactly 45 degrees and that the two mating cuts make an exact right angle.

Make the slides next and position them on the platform with the forward edge $4\frac{1}{2}$ " from the miter guide and the inside edge in line with it. This will give you the location of the slides' guide blocks. The guides should fit snugly.

Sand all parts of the finished table carefully and apply several coats of penetrating wood sealer. Polish the underside of the table and the guides with fine steel wool loaded with paste wax and rub to a gloss with a cloth pad.

Identical, matching cuts are insured with this sliding-table

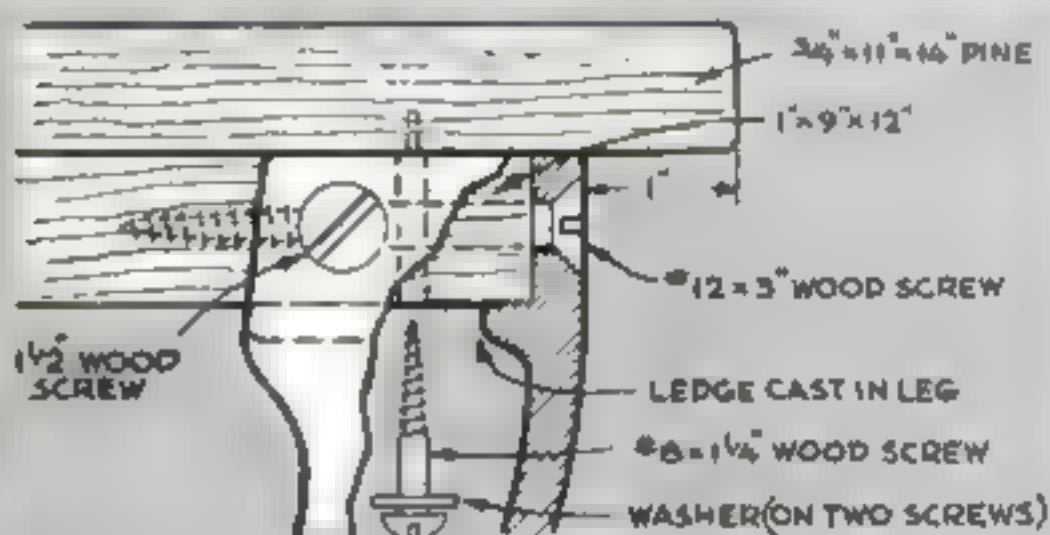
SLIDING-TABLE FIXTURE eliminates even the miter-gauge setting and lets you work on either side of blade. Once it is set up accurately, there are no outside factors to mar fit of joints.

SLOPE ANGLE is determined by distance between slides and miter guide. Make this setting exactly the same on both sides and your compound-angle cuts will produce close-fitting joints.



Short Cuts and Tips

FROM PS READERS



Rugged Utility Stool

IRON legs, salvaged from an old stove or refrigerator and screwed to a double panel, make a heavy-duty footstool for the home or shop. Enamel the legs a bright color and fasten them at the corners of a panel of plywood or solid stock. The 7½" legs shown had a support ledge

inside that determined panel thickness. Attach this assembled unit to a larger panel of pine with screws. Allow for expansion and contraction to avoid splitting or warping. Bore two of the screw-shank holes in the bottom panel oversize, use washers under the heads, and drive the screws snug but not tight.—*Walter E. Burton, Akron, Ohio.*

Dip Pot for Soldering



I TURNED an old electric soldering iron into a small melting pot for dip soldering. The pot was turned from aluminum bar stock, with a threaded shank that screws into the soldering iron in place of the regular tip. The iron is clamped upright to a bent-rod support.—*H. J. Gerber, Stillwater, Okla.*



Keep Blade Strop Handy

BY GLUING a heavy piece of belt leather to the top of my oilstone cover, I can give chisels and plane blades the extra sharpness that is important on a fussy job. Just a few strokes—in one direction only—make a big difference in the cutting edge.—*Herbert Y. Moon, Orient, N. Y.*

Look over this tractor and you'll find—

The Transmission's a Knockout



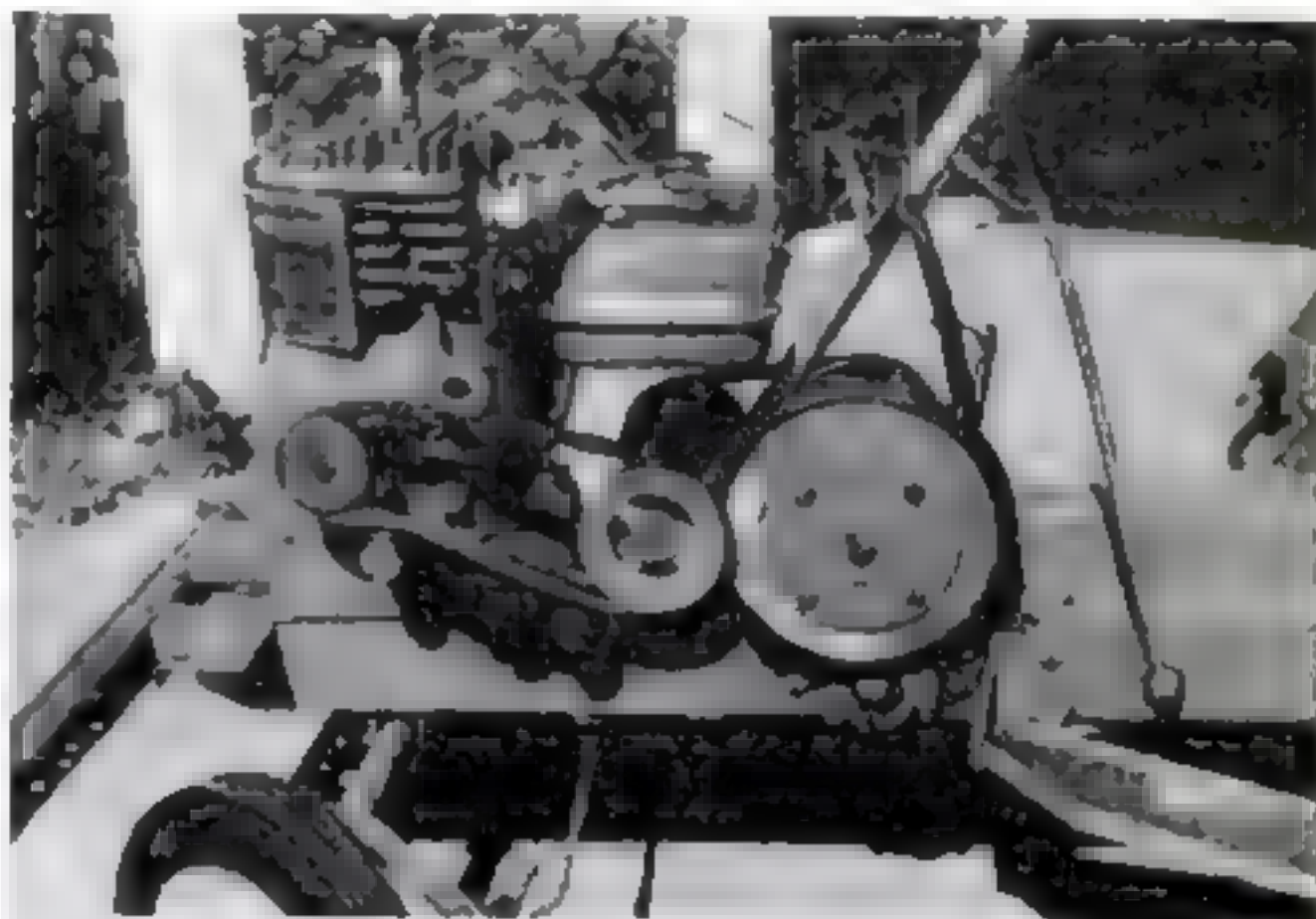
THE real story about this little tractor lies under its well-fitted hood. There you'll find the typical problems of brake, clutch, and reverse neatly solved in a compact arrangement of pulleys and V belts.

Though basically simple, the arrangement is delightfully tricky, and it lends itself to installation in almost any type of small vehicle. The automatic brake and clutch combination, operated by a

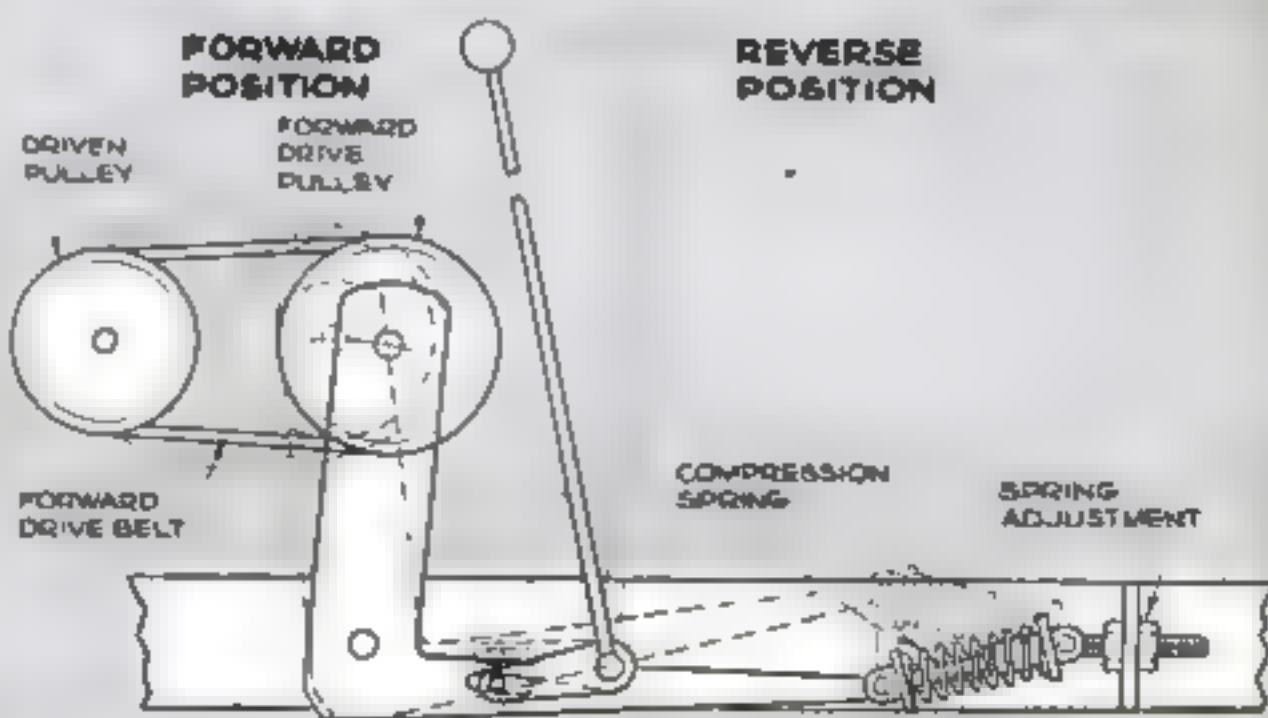
safety pedal, makes it ideal for cars built for children. Run at a fixed throttle setting, it requires only one lever to move it forward or in reverse. When running uphill or pulling a load, the governor opens the throttle to prevent stalling.

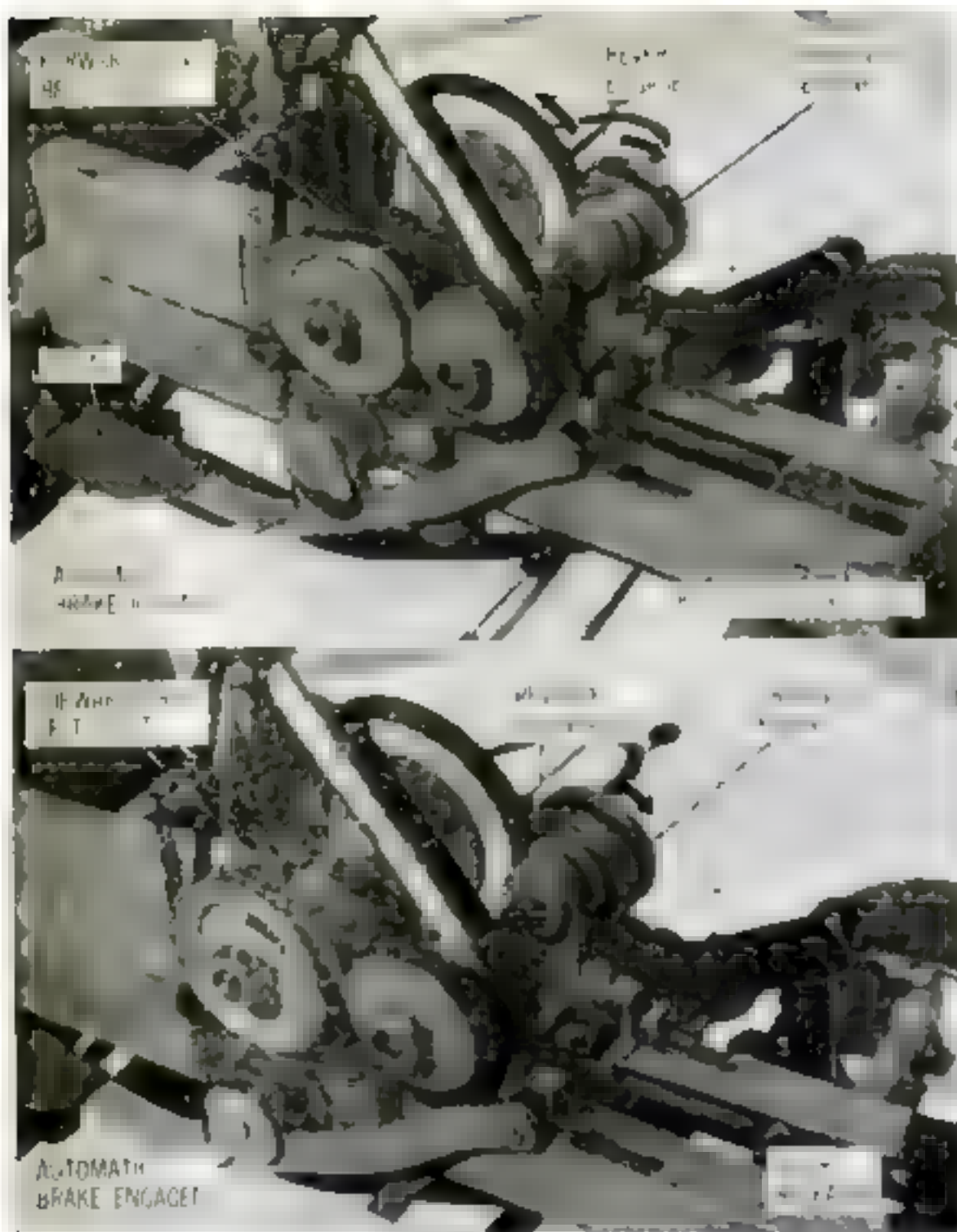
The tractor shown was built by Arleigh Strasser, Fort Worth, Tex., for his three-year-old son. Used power-mower parts kept machining to a minimum. Total cost was less than \$25.

POWER FROM ENGINE is transmitted by V belt to the fixed jackshaft on the transmission. A belt-tightening idler takes slack out of the belt only when the child depresses the safety pedal on opposite side of tractor. Rubber-rimmed disk is reverse part of transmission described in detail below and on following page. Sprockets and chain link transmission to the vehicle's rear wheels.



PIVOTED JACKSHAFT is controlled by shift lever. When lever is moved forward, jackshaft swings back to tighten forward drive belt on pulley driven by engine. Pulled back, lever loosens belt and presses rubber-rimmed disk, shown in photo above, against driven pulley to reverse tractor. The over-center spring locks the shift lever in either position, leaving both hands free for steering.





Right-side view of transmission at work

SAFETY PEDAL controls both brake and belt-tightening "clutch." When pedal is depressed, the automatic spring-loaded brake releases, and the drive belt from the engine is tightened by the idler to transmit power. In the photo (left) shift lever is in reverse position—the forward drive belt is loose and the rubber-rimmed friction wheel is pressed against driven pulley to reverse rotation of pivoted jackshaft.

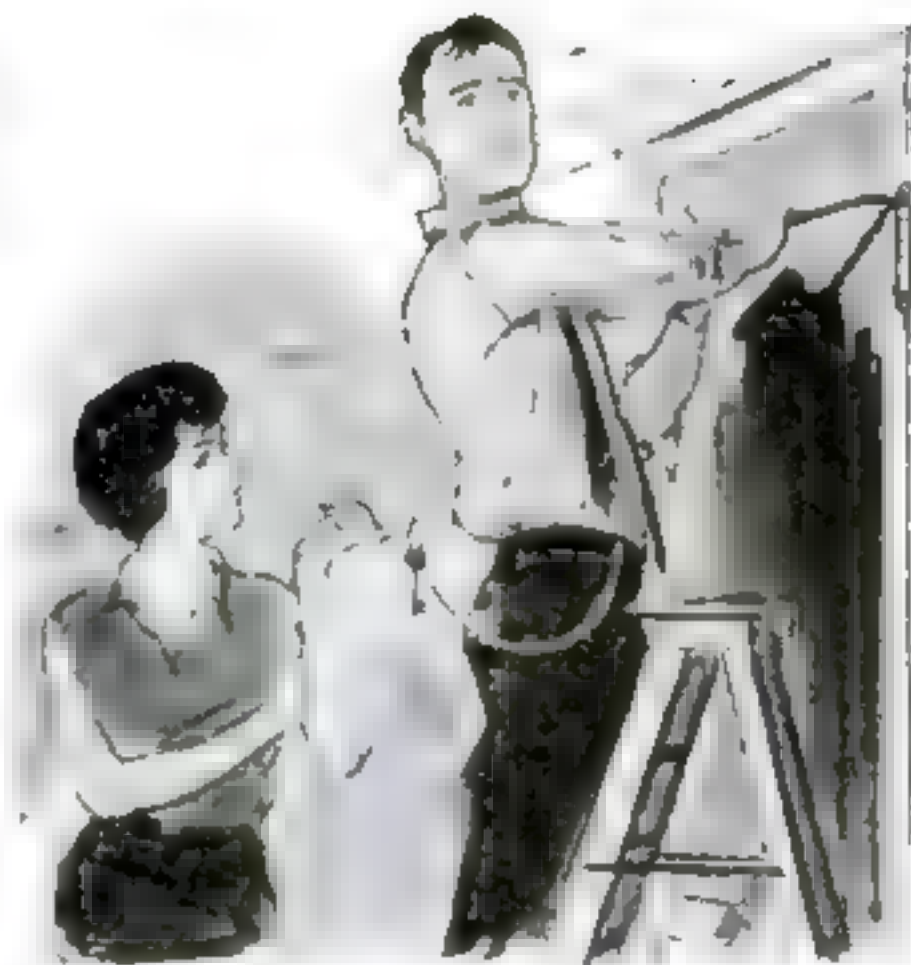
WHEN PEDAL IS RELEASED, the idler drops away from the drive belt, permitting it to slip, or "declutch." At the same time a spring pulls the automatic brake snug against the brake pulley to lock the wheels. In photo at left, shift lever has been moved to the forward position, disengaging the rubber-rimmed reverse-drive wheel and tightening the forward-drive belt for direct drive. Engine was removed to show parts.

My Most Embarrassing Shop Moment

I CAN fix anything, I used to think. One day my wife called me at the office and said she had been locked out when the back screen door accidentally closed behind her. She was calling from a neighbor's house and wanted me to come right home. As annoyed as I was, I felt an impish delight at the prospect of showing her a simple trick—just remove the door from its hinges.

When I arrived, my wife was still at the neighbor's so I went to work. It was a broiling day and the hinge pins were rusted in tight. Finally, tired and sweaty, I had just pried out the last pin when my wife appeared and said quietly, "Why don't you just use your front-door key?"

I had been so anxious to show off, that I had completely forgotten my own key.—*Robert C. Bradley, Massapequa, N.Y.*





Short Cuts and Tips

FROM PS READERS

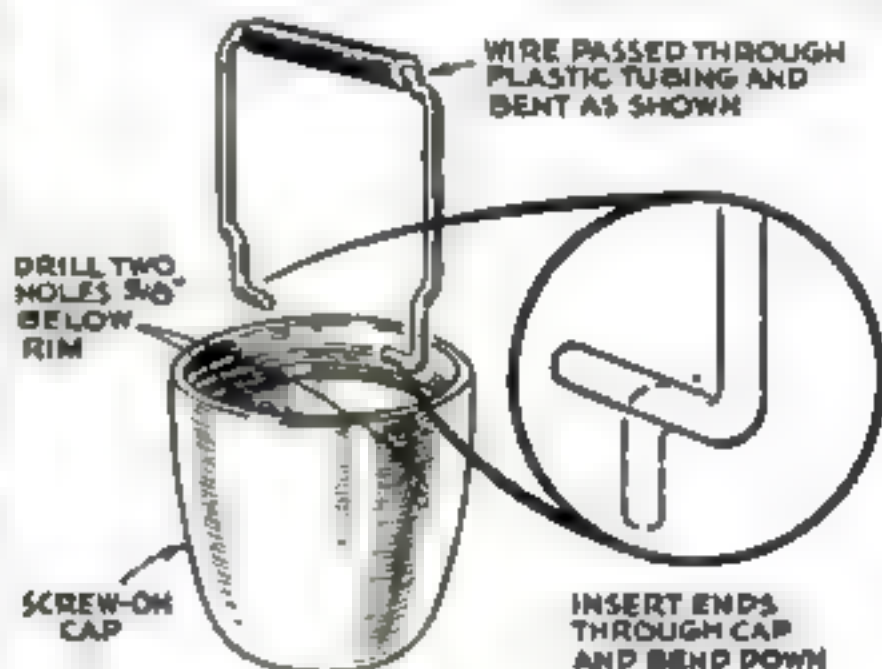
Tracing at the Dining Table

THIS back-lighted tracing table takes only seconds to set up and provides brilliant images for copying maps and pictures. Pull apart an extension-type dining table, leaving a space in the middle a foot or so wide. Lay a sheet of glass borrowed from a picture across the opening and place a table lamp on the floor below it.—*Mrs. Lee Martin, Malin, Ore.*



Handle for Thermos Bottle

A QUART insulated bottle is awkward to carry—especially on a crowded bus. When I modified mine for easy handling, my fellow workers in the machine shop wanted to know where they could buy one like it. The handle, attached to the



screw-on cup, also provides a secure stand for setting the bottle on its side. An old rabbit-ears TV antenna supplied both the aluminum wire and the plastic handgrip. Since there are extra cups, I don't need this outside one, though it's still usable if the need should arise for it.—*Fred T. Barrie, Chicago.*

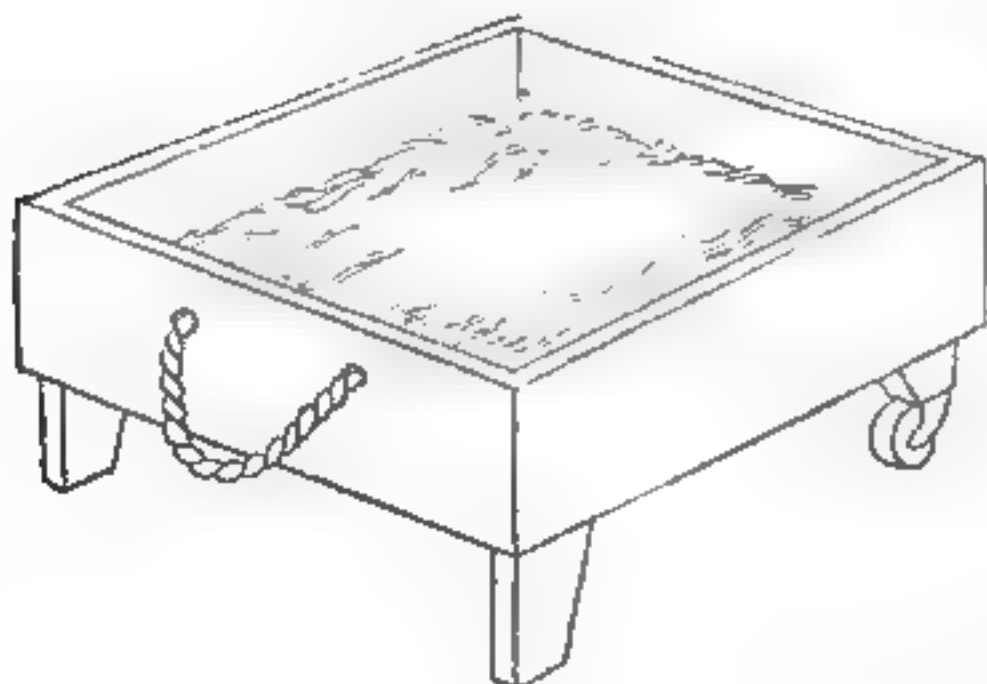
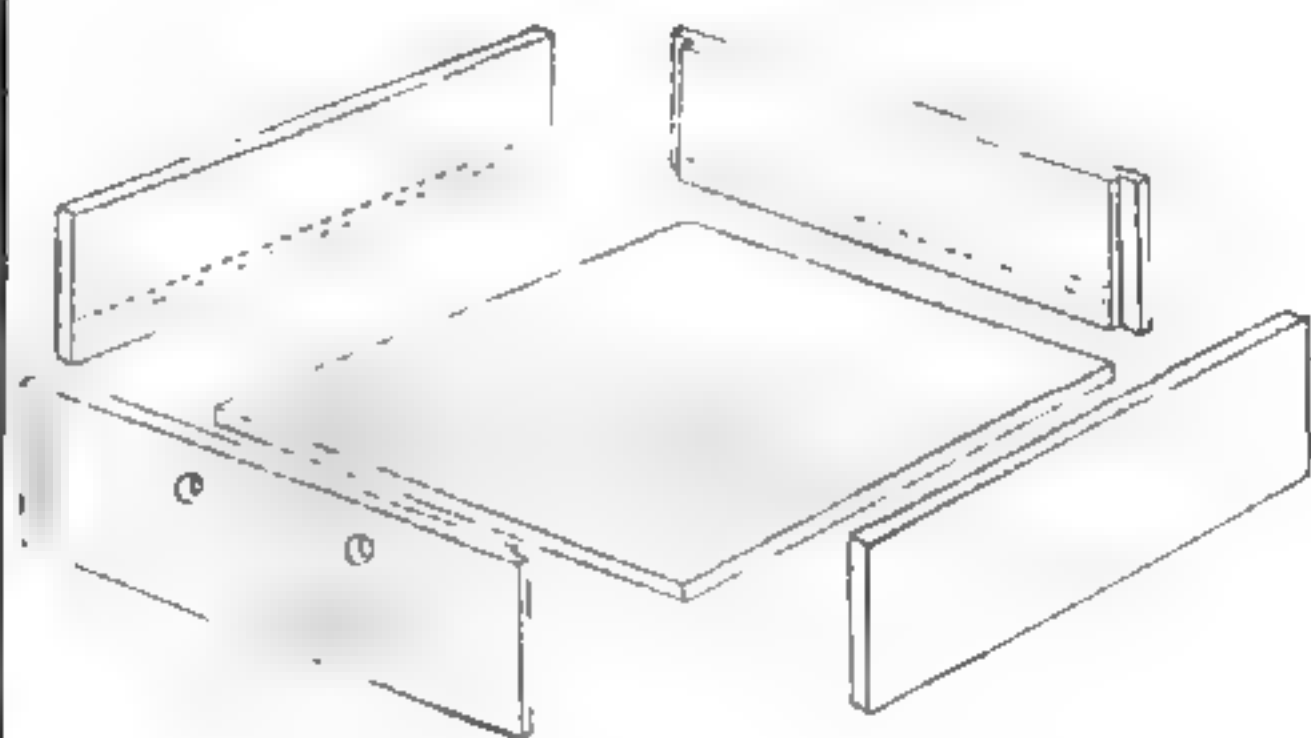
Burning a Paint Can Clean

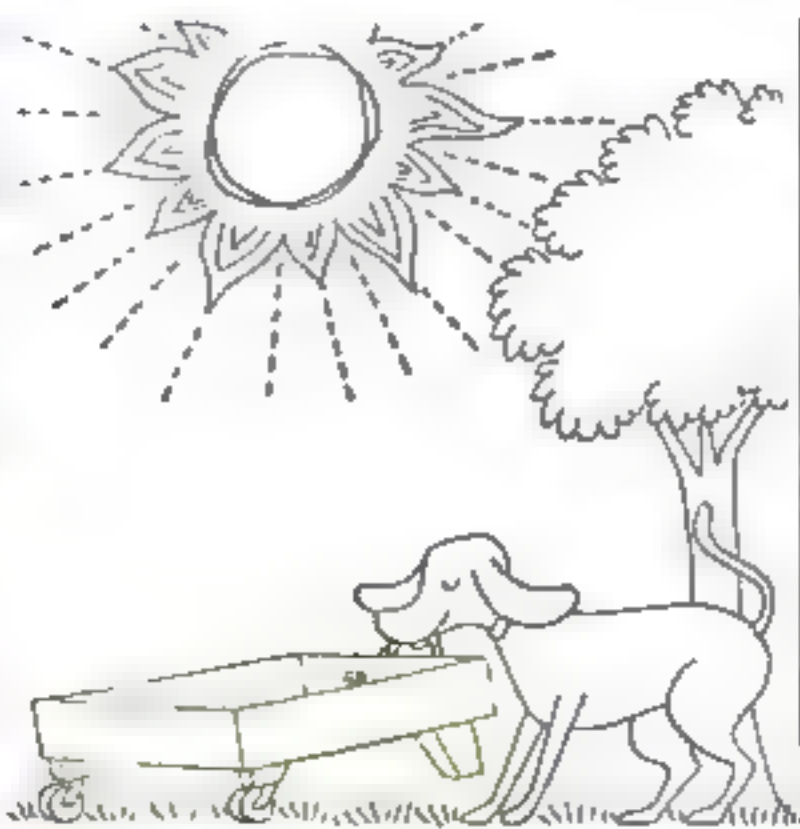
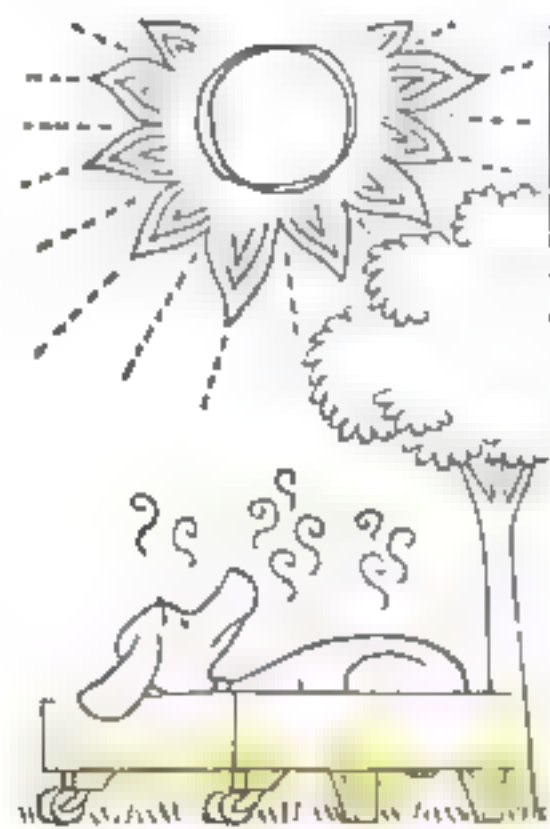
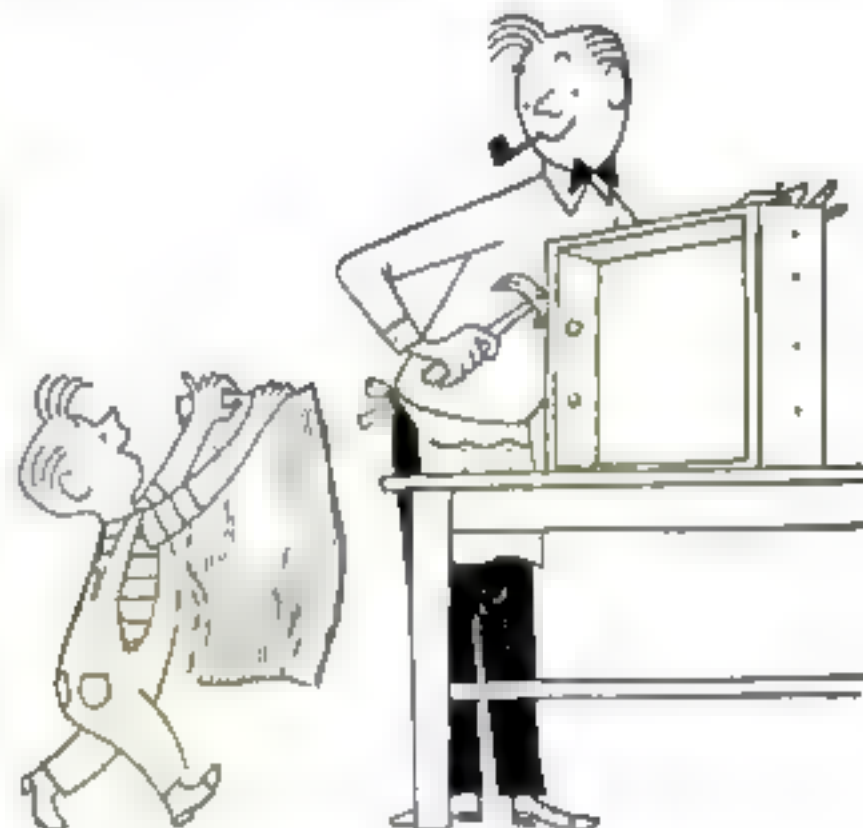
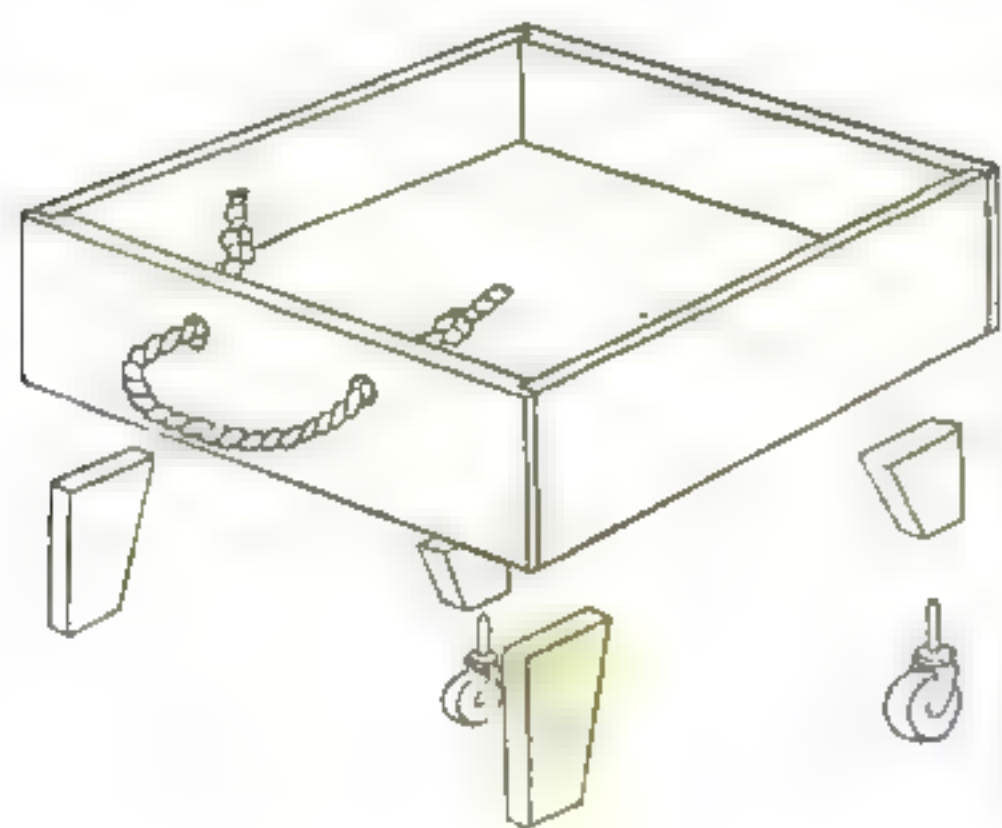
YOU'LL want to save the five-gallon pails in which paint or roofing compound is sold. The best way to remove the residue is to burn it out, but the wooden handle is often ruined in the process. To prevent this, lay the pail on its side with the handle on the ground and cover the handle with an inch or two of sand or earth.—*W. C. White, Carlinville, Ill.*

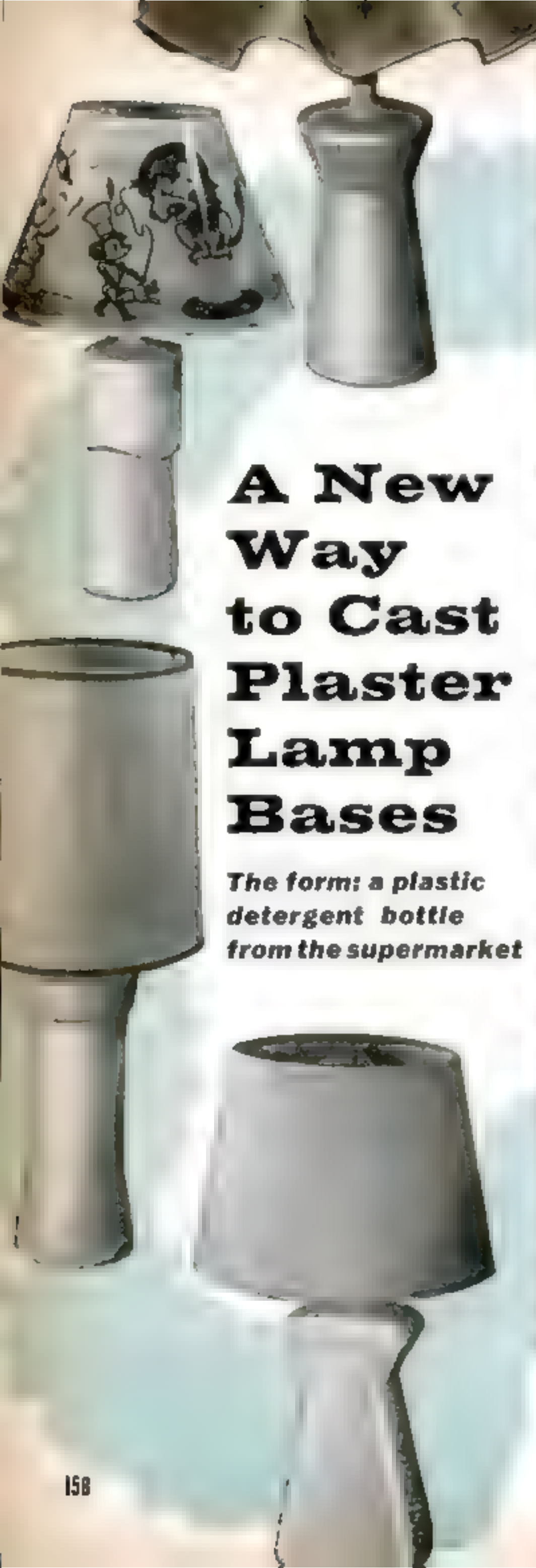


Wordless Workshop

By Roy Doty
and Ruth Libbey







A New Way to Cast Plaster Lamp Bases

The form: a plastic detergent bottle from the supermarket



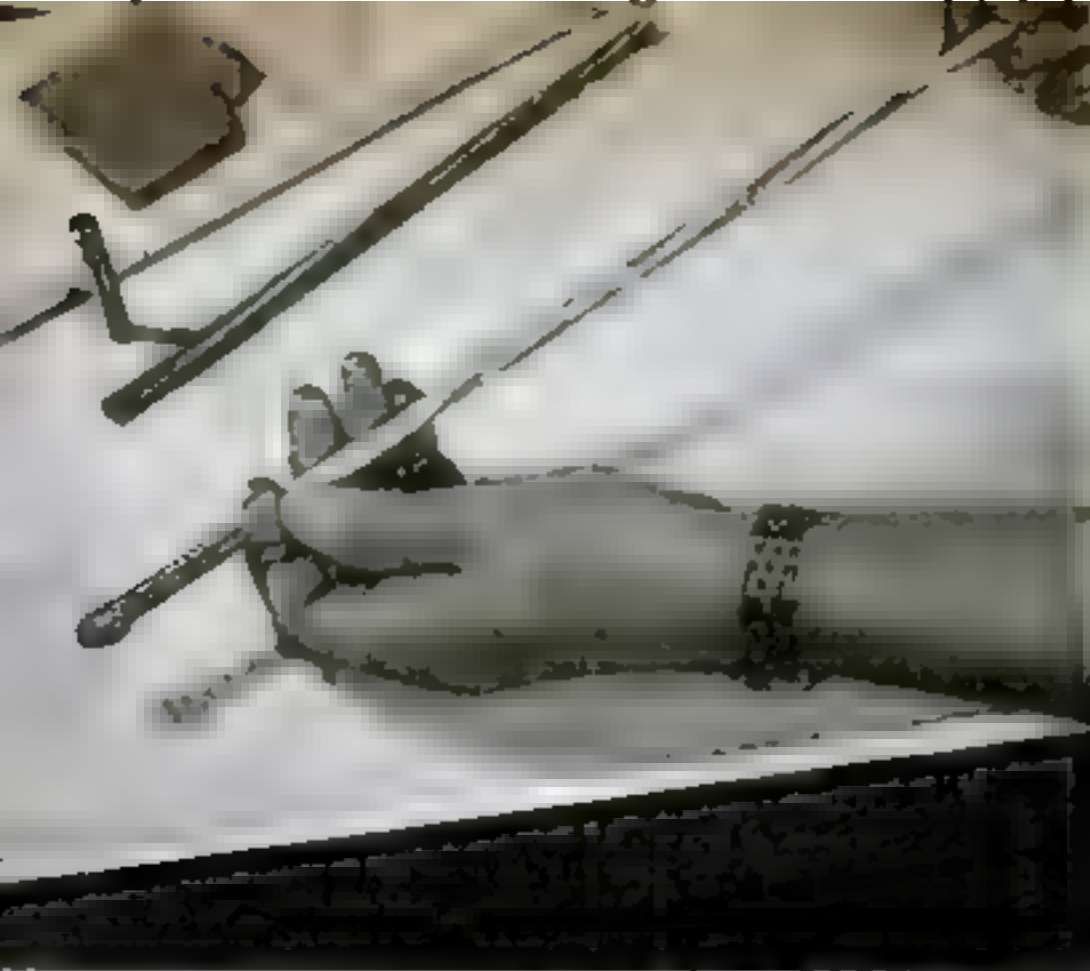
CUT OUT BOTTOM OF BOTTLE with a soldering gun or heated screwdriver to melt the plastic. Leave a slight rim on the bottom to give the plaster a rounded edge. Drill a $\frac{3}{8}$ " hole through the bottle cap for the lamp stem.

By Howell M. Burke

TAKE a look at those plastic detergent bottles your wife uses and you'll find they come in many smart-looking shapes. Fill an empty bottle with plaster and you have a perfect mold for casting a lamp base that costs practically nothing. After the plaster sets,



LET THE PLASTER SET for an hour. Then pull out the dowel and plastic tubing, leaving the brass nipple embedded inside. Slit the plastic bottle up the side with a soldering gun or heated screwdriver and gently peel it off.



LAMP STEM is made up of a 3" threaded brass lamp nipple and a length of $\frac{3}{8}$ " plastic tubing, such as a toy beanshooter. Slip these on a $\frac{1}{4}$ " dowel to hold them aligned and seal the joint with modeling clay to keep plaster out.

the plastic mold is easily removed—just peel off the bottle.

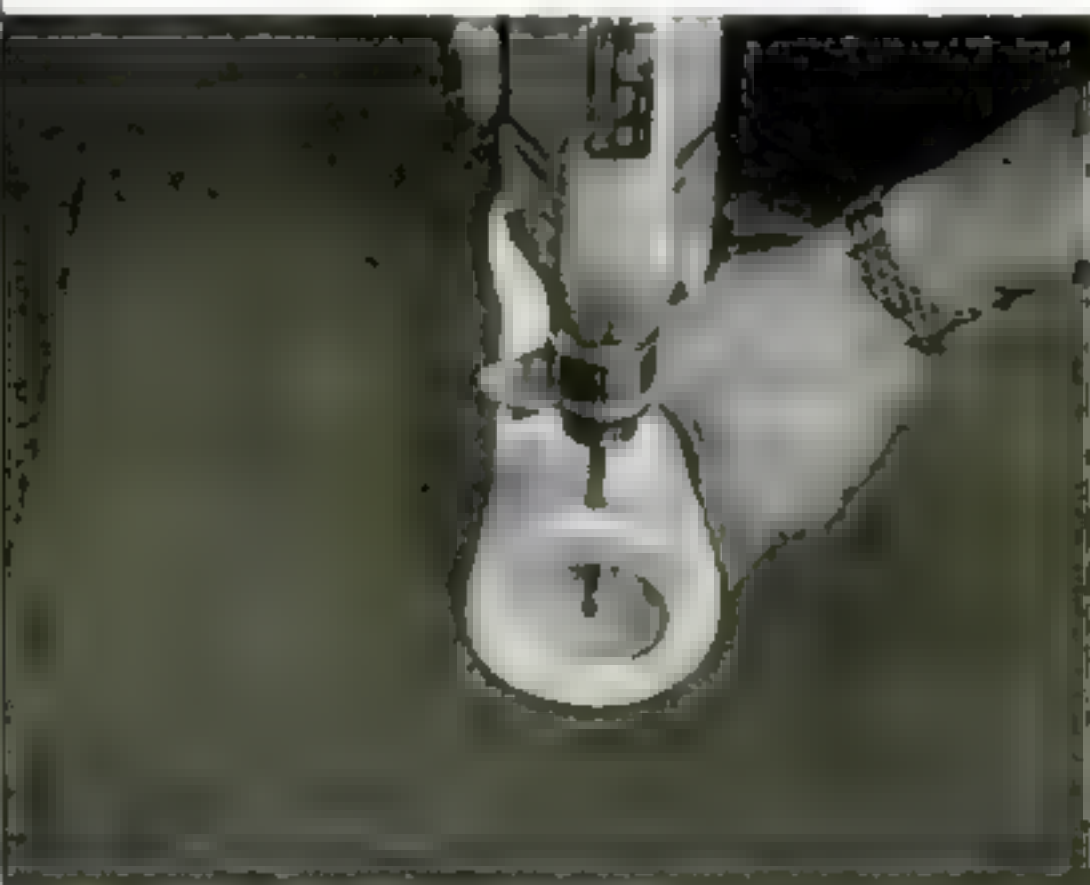
No. 1 molding plaster, mixed to a pancake-batter consistency, gives smooth, dense castings. A stem to hold a standard lamp socket is made by embedding a short threaded lamp-pipe nipple into the neck of the casting. To hide the wire, a length of hollow plastic tubing is cast



BOTTLE IS TURNED UPSIDE DOWN over a jar and the stem inserted so it protrudes $\frac{3}{8}$ " through the cap, as at left. Pack clay around the cap to hold the stem, and pour in the plaster. When bottle is almost full, slip a paper cup with a hole in it over the stem and press it $\frac{1}{4}$ " into the plaster, as at right. This forms the recess needed in the base for the lamp cord.



into the plaster. When removed, it leaves a hole down through the center. Or, if you prefer, a longer pipe nipple can be run all the way through the base. Before painting the lamp base, apply a sealer of the kind used on plaster walls.



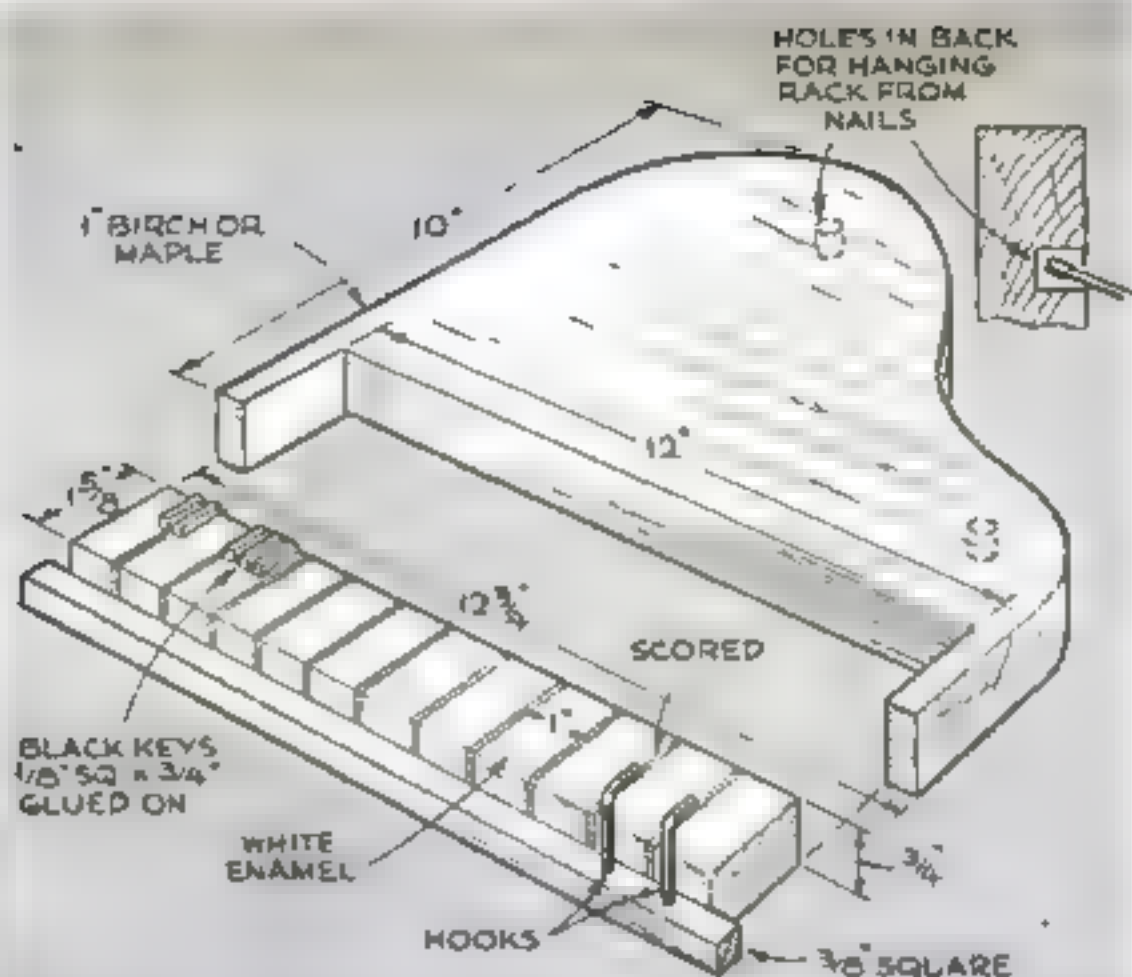
DRILL A $\frac{1}{4}$ " HOLE through the side of the base into the recess at the bottom for the lamp cord. Sand the bottom of the base smooth. Before painting, patch with plaster any imperfections in the sides caused by air bubbles.



THREAD LAMP WIRE down the center hole in the base and out the side hole for a neat, professional effect. The socket screws onto the protruding lamp nipple and the shade clips to the bulb, eliminating the need for a harp.

Short Cuts and Tips

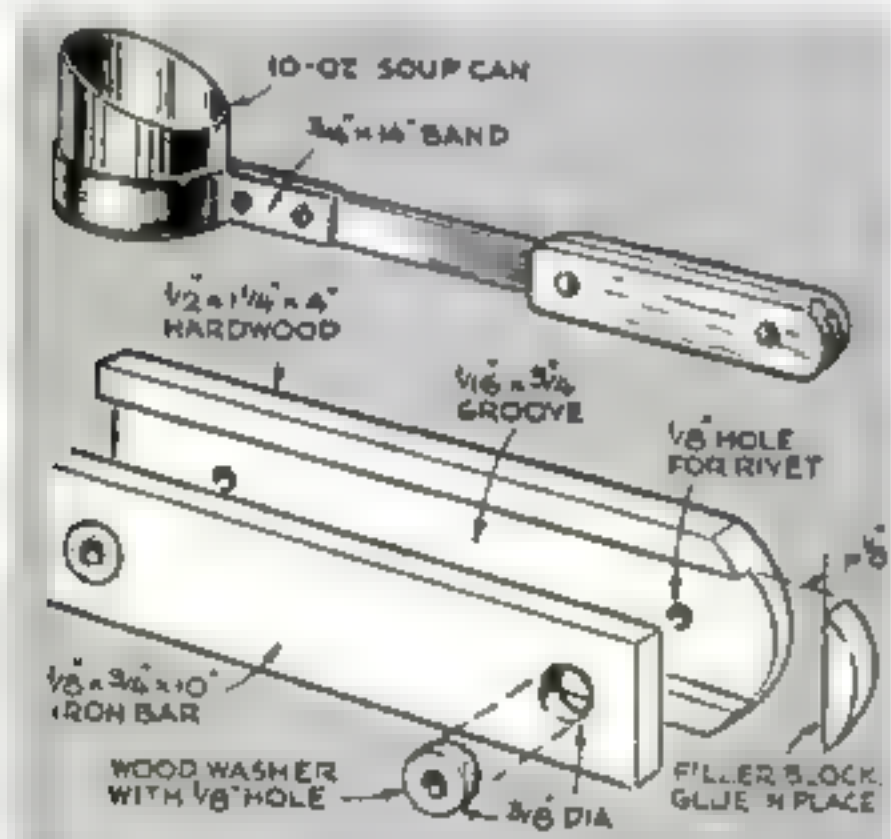
FROM PS READERS



Decorative Rack Stores Keys

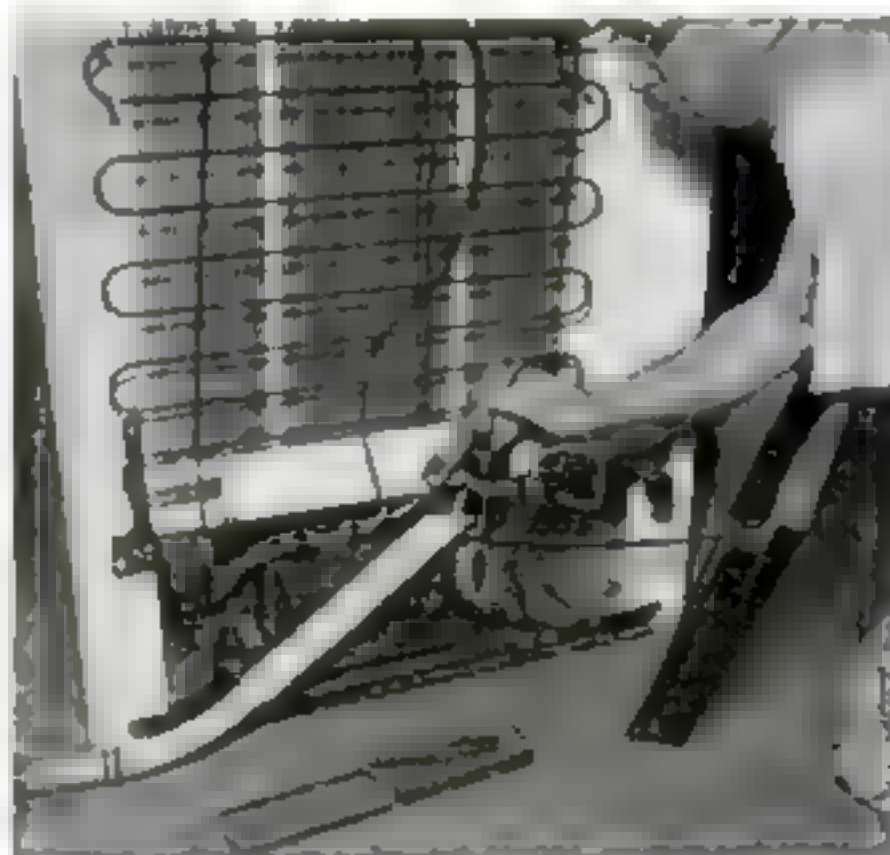
Keys won't get lost if you keep them stored on an attractive rack like this. The piano profile is jigsawed from 1"

hardwood, finished natural, and the dummy black and white keys are glued to it. There are spaces at the bottom for up to 12 hooks—enough to hold all the keys in the family.—Hi Sibley, Nuevo, Calif.



Homemade Ladle for Lead

AN EFFICIENT ladle for melting lead can be made by clamping a cut-down soup can to a handle with a band snipped from a 24-gauge sheet of galvanized iron. Shims can be added to tighten the grip on the can and permit easy replacement. The grip will have no hot spots since the iron-bar end is covered with wood and the rivets are inserted through insulating washers.—Walter Fehlberg, La Crosse, Wis.



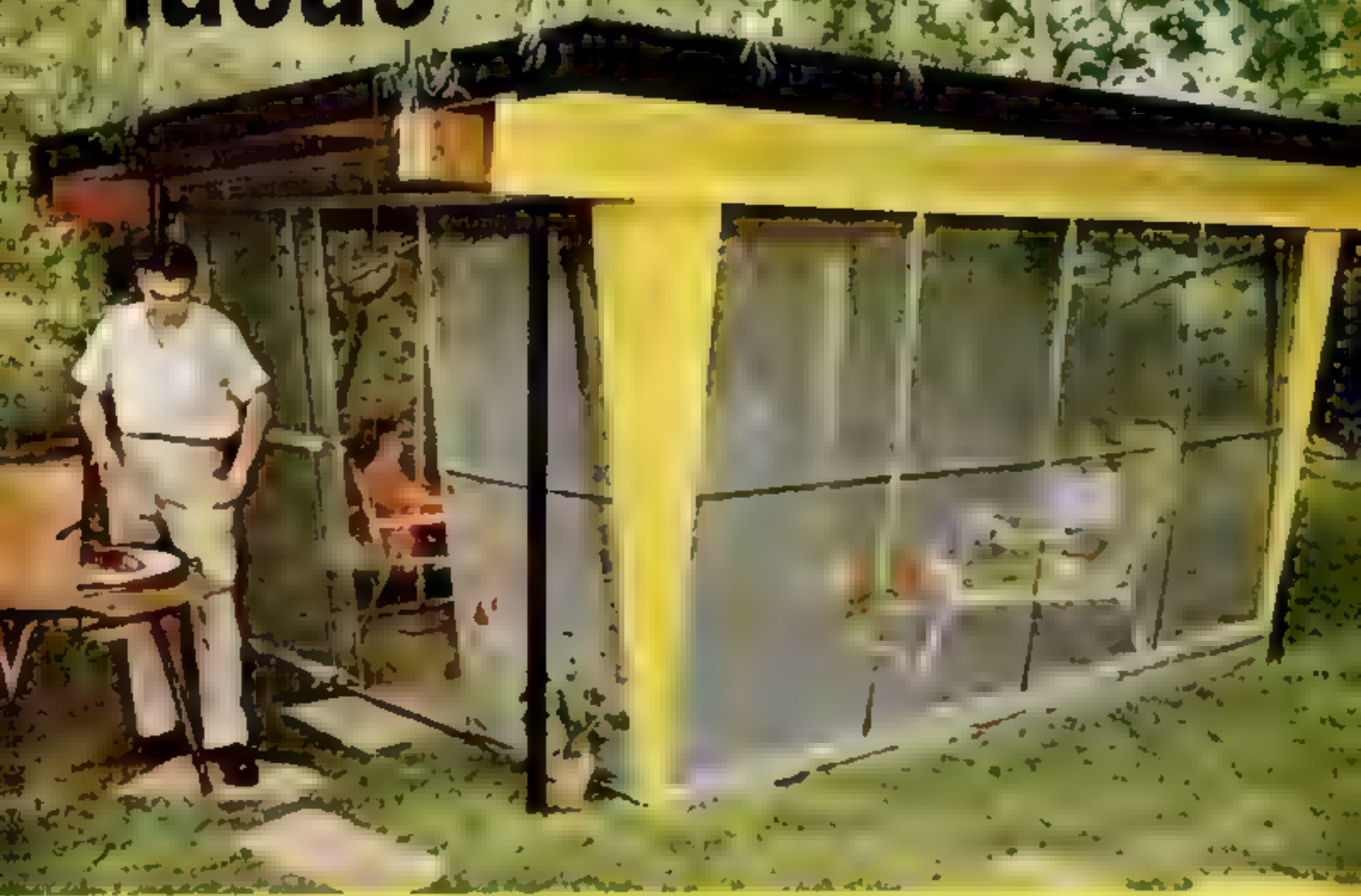
Dusting Refrigerator Coils

ALTHOUGH the operating mechanism of a refrigerator is sealed and should run for decades without attention, the expansion coils are usually exposed—mounted on the back. Accumulations of fuzzy dust can eventually reduce cooling efficiency, so about once a year move the cabinet away from the wall and dust the coils with an old paintbrush and a vacuum cleaner.—R. Hertzberg, Douglaston, N. Y.

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Cover photo by Robert D. Borst

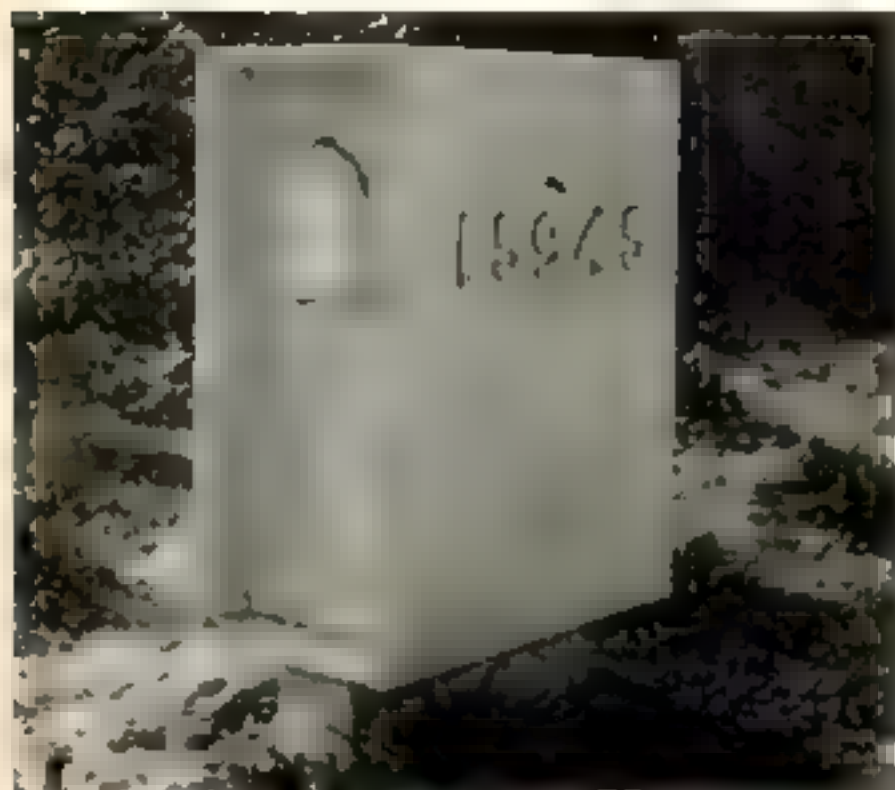
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"Home Improvement Ideas," published as a supplement to a regular issue of Popular Science, is devoted exclusively to the physical betterment of the average man's greatest investment—his home.

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Handsome Mailbox Posts

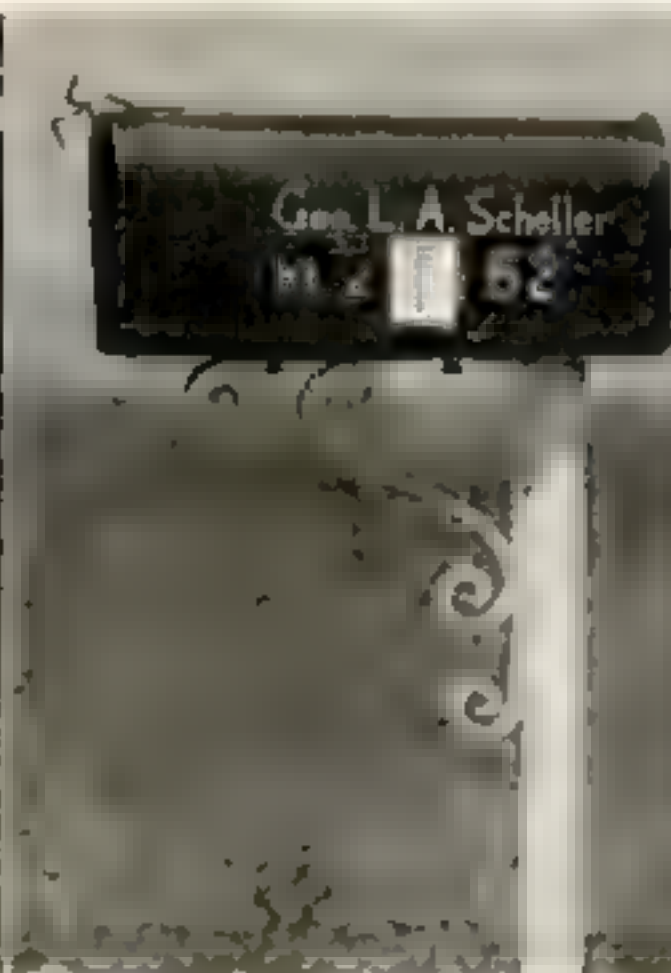


MODERN LOOK: Who says a mailbox has to look like one? Here a strictly legal box is camouflaged by a modern plywood enclosure mounted on a low concrete pedestal. Space below mailbox can house newspaper-delivery boxes.

A PLAIN BOX gets a classic New Orleans look, as at right, with a support made from a section of ornamental wrought-iron porch column.



SIMPLE FLOWER DESIGN like this put on with a toy stenciling set, perks up an ordinary wood post.



LENGTH OF PIPE set in concrete with a decorative bracket welded on makes a trim post that resists rotting and wayward cars.



PICTURESQUE POST, once part of a porch column or a newel post, adds a rustic touch to a country home.

**A sunshade overhead, breezes drifting by, insects outside screened walls.
A perfect combination for relaxing**

A Summer House in Modern Design

By R. J. Lehman

EVERYTHING is modern in this summer house, including the construction—it's built from the top down.

Modern materials—fiber-glass panels, plastic screening, and aluminum frames—were combined to carry out the design, yet the house cost me only \$270 to build near Binghamton, N. Y.

The broad 12'-by-16' roof caps a 9'-by-12' flagstone patio. Do-it-yourself screens lean outward from patio to roof on three sides, making the house appear larger than it is. The rear wall, facing a wooded area, is vertical.

INSIDE THE SUMMER HOUSE, you get a feeling of spaciousness that is created by the outward-sloping screen walls. The single door at the end glides on sliding-door hardware.

The fiber-glass panels that close the corners between the sloping screens are merely decorative; four 2" pipes set in concrete footings below the frost line support the structure. Bolt two-by-eight beams to the top of the pipe and lay



two-by-six rafters across them. Tie each rafter to the supporting beams with nailed-on lengths of strap iron. To give additional support, toenail short lengths of two-by-six between the rafters to form a grid. Cover the roof with 2'-by-12' panels of corrugated metal or fiber-glass roofing running from front to back.

The patio should be centered beneath the roof on three sides and 1' in from the rear edge. Build a shallow wall of narrow flagstones to retain 4" of firmly packed sand. On top of this, lay a flagstone floor, fitted closely.

Anchor aluminum angle around the perimeter of the patio with expansion plugs set in holes drilled in the flagstones. The bottom edge of the screen wall is later bolted to this angle.

Nail a framework of two-by-two lumber across the supporting beams at both ends, and along the front of the house to fasten the tops of the screens. Rear screens are screwed to the supporting beam.

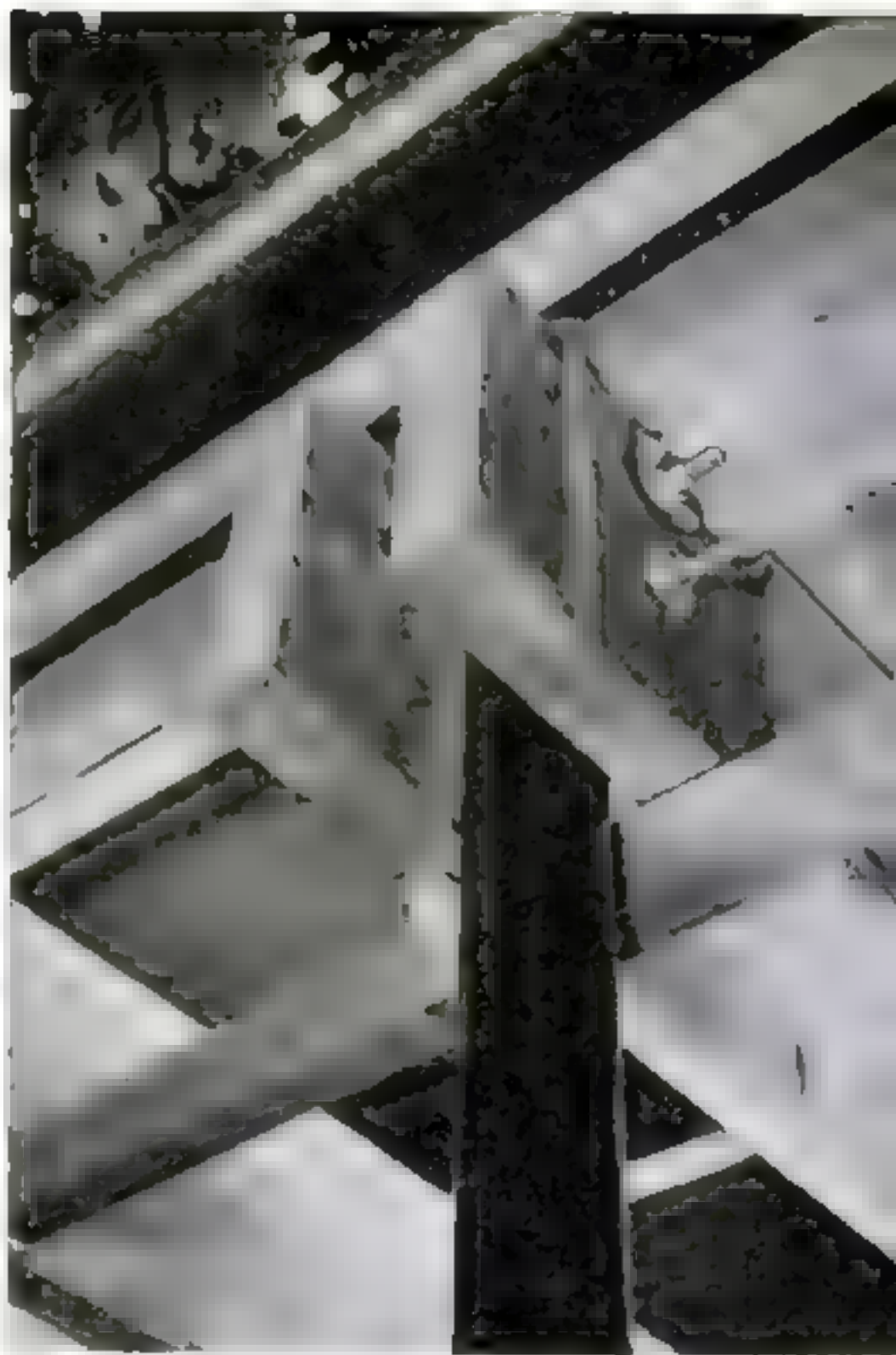
Assemble the 3'-by-6' screens from do-it-yourself screen framing, and fasten them in position on all four sides. Cut and fit tapered pieces of sheet fiber-glass to fill in the sloping corners. After fitting, reinforce the fiber-glass with a framework of one-by-ones screwed to the inside surface. Leave about $\frac{1}{2}$ " of fiber-glass overlapping the frame; this forms a rabbeted edge, which fits over the screens. Note that the screens at the rear of the house are vertical, and require only one tapered panel to fill the corners.

Finish off the front of the house by fastening a 9'-by-16' strip of fiber-glass over the frame supporting the screens. Fill in open areas between the walls and rafters with screening nailed or stapled permanently in place. Nail a 16' soffit of 1" pine under the roof overhang at front.

Create a doorway at one end by hanging the center screen on sliding-door hardware. Strips of fiber-glass fastened across the adjacent screen make the door slide easily behind it.

Paint the supporting pipe and roof fascia to contrast or blend with the color of the fiber-glass. I used yellow fiber-glass and black trim.

In areas having severe winters, the screens can be removed for safe storage. The broad, overhanging roof provides carport protection for garden equipment stored beneath it.



SUPPORTING BEAMS, two at the front (shown above) and one at rear, are bolted to 2" pipe set in concrete footings. Rafters are laid over the beams and tied in place with strap iron.



CENTER SCREEN at one end of the house is converted to a sliding door by the addition of nylon rollers and track. A stop on screen at left of door prevents it from rolling off track.

The Machine Way

Why break your back when you can rent a trencher

By John L. Parker

BURY your shovel. Automation has come to ditch digging. If you need trenches for gas or water pipes, sewage, electric or telephone lines, hedge planting, or foundation footings, you can spare your back—and do a faster, neater job—by renting a power trencher. Even as tedious a chore as installing an underground sprinkler sys-

tem is fast work with one of these new dirt-chomping wonders.

Most rental agencies in good-size towns can supply a quality trencher for a reasonable weekend fee. You move the machine to the work site with your car. Some types fit in the trunk; others are towed behind; some are rented with their own trailer. The smaller ones pass easily through a front or patio gate.

Trenchers aren't hard to



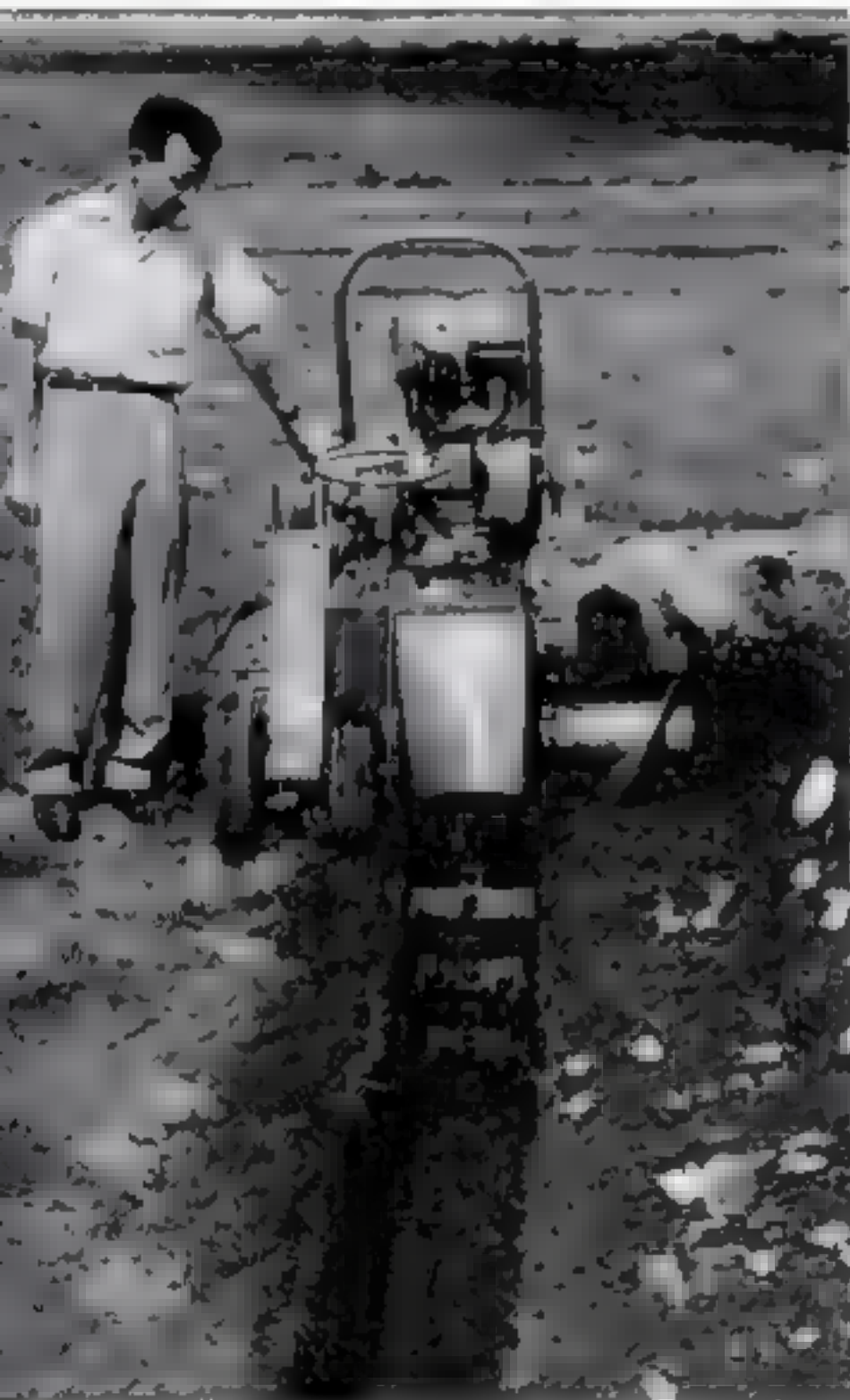
TRACTOR-STYLE TRENCHER is brought to the job on its own trailer, works while you ride. This is the Davis T-66 with all-hydraulic controls,

including boom-lowering mechanism. It'll trench 3" to 6" wide and 5' deep in any type soil. Pipe is laid alongside as a straight-line guide.



to Dig Ditches

that will do the job better in minutes?



MEDIUM-WEIGHT TRENCHERS come in both rubber-tired and track-tread models. Treads increase weight and maneuverability, are ideal for rocky soil. Here, a Ditch Witch is trenching 12" wide, 2½' deep. Note graduated cup teeth



LIGHT-DUTY TRENCHER pulls itself along cable strung to stake driven at end of trench line. Average digging speed is 3' to 4' per minute. Shown is the Davis Pup, which fits in a car trunk and wheels through a 30"-wide gate.

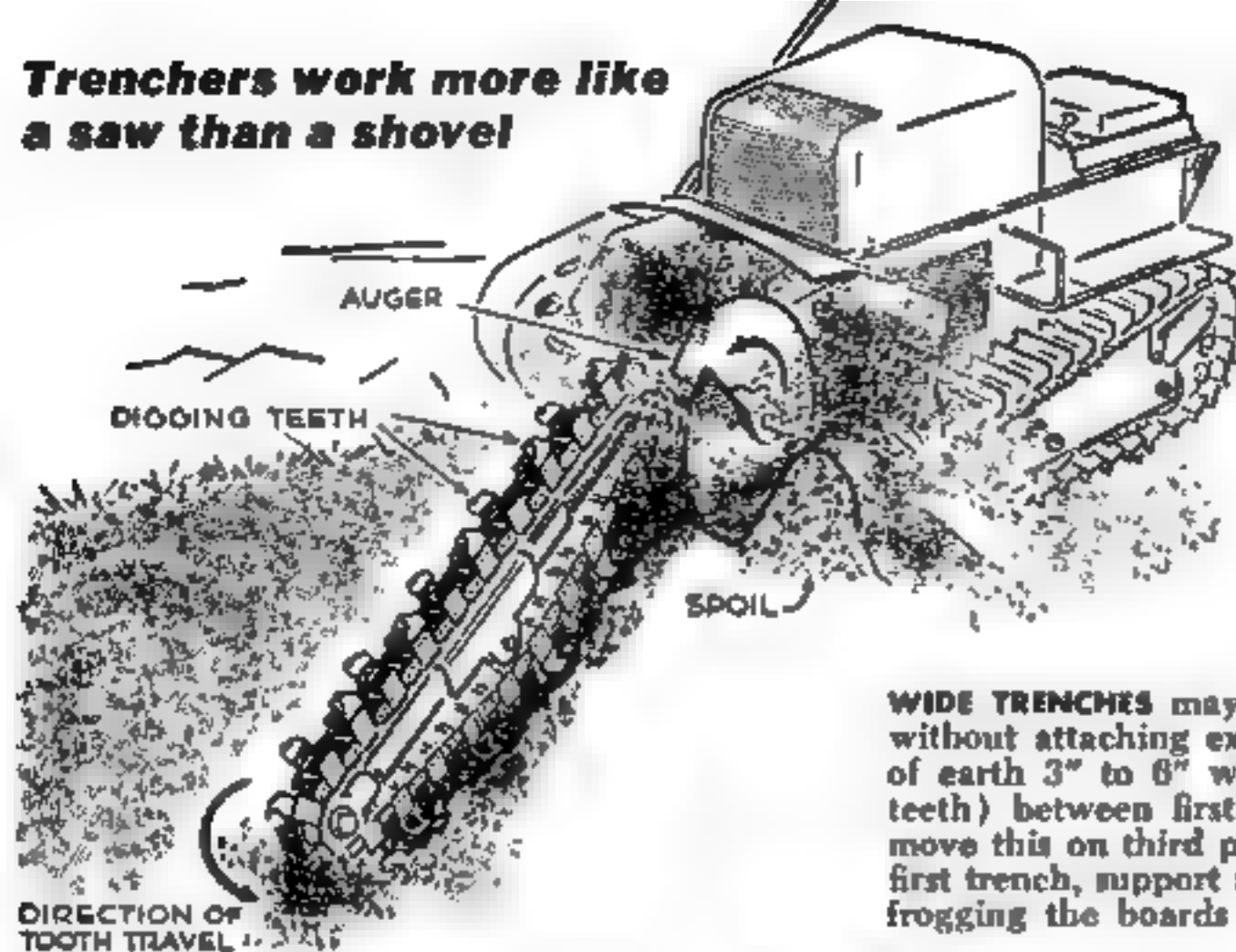
operate. Once the truck is positioned and the motor started, the digging boom is pivoted downward and sunk into the earth. The whirling teeth slice into the soil and scoop it up into a revolving auger-type screw that piles it in a neat ridge along one side of the trench. The action mulches the soil in a manner similar to rotary tilling. Excess soil can be used for flowerbeds and planting rows.

After the pipe or cable has been laid, the ridge of soil is pushed back to fill

the trench. Some trenchers have an accessory dozer blade for this, but you won't need it for 3" or 4" trenches; a rake does the job, or you can attach a 12" board at an angle to the trencher.

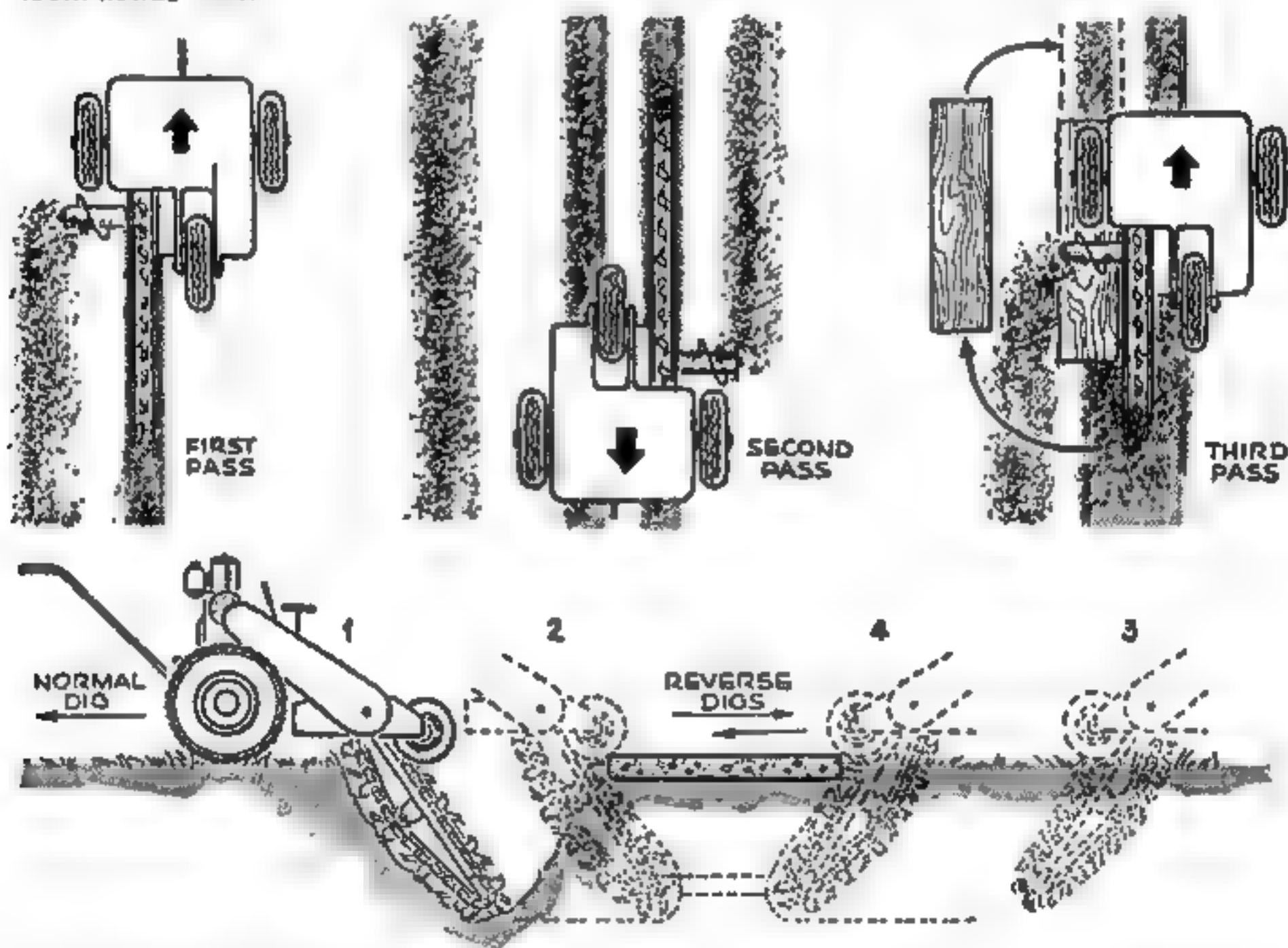
What makes 'em go? Some trenchers have a winch mechanism. A cable is extended from the machine along the line that the trench will follow. Its free end is attached to a stake. While the boom digs, the winch reels in the cable, drawing the trencher toward the stake. Other

Trenchers work more like a saw than a shovel



OPERATING PRINCIPLE is similar to that of a chain saw. Half-cupped teeth project from a roller chain stretched around sprocket wheels on a metal boom. Spoil is scooped up into revolving auger which pushes it aside.

WIDE TRENCHES may be dug in several passes, without attaching extension teeth. Leave pillar of earth 3" to 6" wide (depending on size of teeth) between first and second trenches. Remove this on third pass. If wheel lines up with first trench, support it on bridging boards, leap-frogging the boards in succession.



UNDERCUTTING A SIDEWALK, driveway, or wall to run pipe beneath is no problem. Set trencher far enough back to permit lowering of boom. Dig to desired depth and reverse trencher to

run boom in under obstruction, keeping boom end at least 18" below the bottom of it. Repeat these steps on other side. Then wash through connecting opening with nozzled garden hose.

types are completely self-propelled, with two- or four-wheel drive. Some have crawler treads, like a heavy tractor.

The trenchers shown here will dig in soft or hard soils, and even cut through

asphalt paving. I've kicked out rocks as big as a typewriter with them. The teeth bolt on, and are easily replaced. The maximum practical depth I'd recommend for the lighter models is about 2½'. The



SOD-CUTTING BLADE—attached to some rental trenchers—slices a strip of lawn that can be rolled up before trenching and replaced after backfilling. No scar will show on completion.

steeper the angle of cut, the better they work. The width of the trench depends on the teeth.

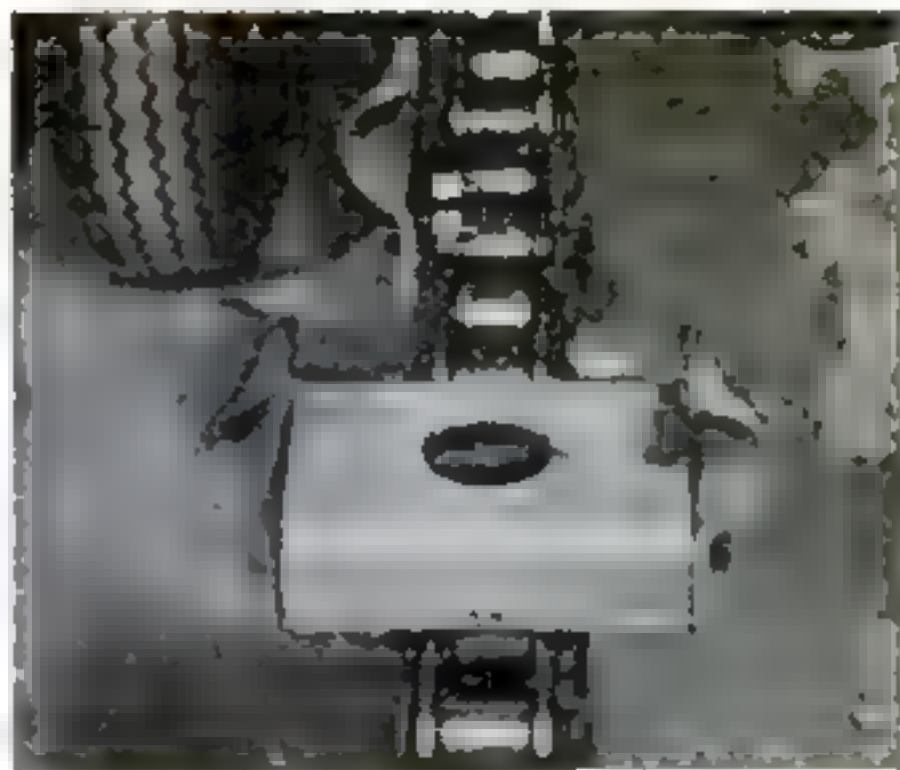
Many trenchers can be rented with extension teeth that will cut a 6" width. Using these in combination with the three-pass system illustrated will give you an 18" planting bed. In this case, you dig the first two parallel trenches deeper than necessary and deposit fertilizer in them. When you run the trencher down the center, it will flatten the pillar within the trench while it mixes the dirt and fertilizer thoroughly.

On the other hand, if you want a solid bottom in the trench, as in foundation work, you half-fill it with water the day before you pour your footings. Don't fill it completely or the sides may crumble.

Undercutting. A four-position method for getting under sidewalks and other obstructions is shown on the facing page. Another method is to ease the boom under as it is lowered, and then back off the machine about 3' to dig space for working with the hose nozzle. Blast the opening through as high as possible so that water and mud will run into the deeper trench on each side. If the undercut is a long one, fasten the nozzle and hose to a stick or length of pipe to hold it straight while passing it through.

With plastic or copper pipe, you can clamp or tie one end to the nozzle before you pull the hose back through the hole. That way, you pull the pipe into place as you remove the hose.

You needn't bother with a sod-cutting



ADAPTORS BOLTED TO CHAIN extend the capacity of a trencher. This one spaces teeth for a cut 6" wide. Teeth are sharpened on leading edge, cupped to lift soil on return stroke.

blade for very narrow trenches. Just run a band of composted manure along the top of the backfill after it has settled. The grass will cover the scar within a few weeks.

A word of caution: Treat the trencher with the same respect due any power lawn equipment. Keep kids and pets at a safe distance while it's operating.

For more information . . .

The trenchers you're most likely to find at rental agencies are products of the following manufacturers. For detailed specifications on any machine—or information on a rental agency near you—write direct:

- Davis Mfg., Inc., 1500 S. McLean Blvd., Wichita 13, Kan. (Small, cable-propelled models dig 3" trenches to 2½' depth, can be carried in car trunk. Company also makes heavy-duty tractor type.)

- Charles Machine Works, Inc., P.O. Box 66, Perry, Okla. (Ditch Witch trenchers. Four models, from 7-hp. C-3—digs 3"-6" wide to 2' depth—to 30-hp. four-wheeled tractor. All self-propelled and rubber tired, M series also available with crawler tracks.)

- Arps Corp., New Holstein, Wis. (Trench Devil digs 2¾" wide to 1½' depth; cable-propelled by hand winch.)

- Stampings, Inc., Davenport, Iowa. (Pow-R Spade digs trenches 3" wide to 2' depth; pulled by hand.)

- Vermeer Mfg. Co., Pella, Iowa. (Four-wheel drive with hydraulically powered digging boom; digs 4" wide to 3' depth, has backfilling blade.)

- Brown Mfg. Co., Woodbine, Iowa. (Bus Brown trencher digs 3"-6" wide to 5¼' depth. Four-wheel drive. Not successful in hard ground.)



New Miracle Patches for Concrete

By David X. Manners and Sheldon M. Gallagher

FOR the first time, you can stick back that broken-off concrete porch step and make it really stay. Cracks in concrete driveways, walks, and retaining walls that keep reappearing after you've patched them a dozen times can now be sealed for good. A badly deteriorated garage or cellar floor can be given a smooth, new top coating that's only paper-thin but tough as iron.

The secret lies in two remarkable new concrete patching compounds that stick to anything, are many times stronger than ordinary concrete, and are as easy to use as concrete itself. These wonder patchers are different chemically, but do similar jobs:

- Latex concrete is made of conventional cement and sand, but mixed with liquid

rubber (latex) instead of water. The result is a tough, fast-setting patching filler that makes an almost indestructible bond with ordinary concrete, wood, steel, even glass. In tests, it has resisted pulls of up to 800 pounds per square inch without coming loose.

- Epoxy concrete is actually not a true concrete at all but a combination of epoxy resins, hardeners, and sand. It forms a dense, rock-hard patch that has many of the same characteristics as today's epoxy glues. It has a tensile strength of 1,000 to 1,500 pounds per square inch—twice that of ordinary concrete—and will not crack under heavy blows or freezing, as concrete will.

What they're good for. Both epoxy and latex concrete put an end to the problems of working with regular cement. They set quickly, do not have to be kept moist and covered for days during curing, and provide a surface that can be walked on in 24 hours. They won't shrink, crum-

ble, or scale away like ordinary concrete, and can be troweled out to feather-thin edges without cracking or wearing off.

Ordinary concrete can't be laid thinner than 1" without losing its strength, and for many jobs a minimum of 2" is recommended. The new epoxy and latex compounds can be spread as thin as $\frac{1}{8}$ ". Coatings are already in use on heavily traveled factory floors, bridges, and highways without showing wear. This means you can renew an old concrete path, patio, or driveway by simply spreading on a light topping.

The coatings can be used in the same way to resurface an old basement floor or to level up an uneven floor. The thin toppings don't appreciably raise the original floor level so there's no problem

with surrounding levels—door thresholds, baseboards, built-ins, floor drains, and electrical fixtures can stay just as they are. The new surfaces are so tough you can play games on them, dance on them, or roller-skate on them—without scuffing or cracking them.

Slightly thicker coatings can be put over old wood floors to provide a smooth, rigid foundation for linoleum or tile. Because the patchers cling hard and are highly water-resistant, they're ideal for such tricky jobs as plugging swimming-pool leaks, sealing shower stalls, and setting railings and other metal fixtures in concrete. You can also leakproof brick walls, chimneys, and sewer pipes just by pointing up the joints with the patchers.

Both types of coatings are flexible and give under stress without cracking. Both provide sure-footed, skidproof surfaces that are easy to walk and play games on. The latex type can be colored by adding ordinary powdered cement colorings during mixing. Some of the epoxy types come precolored in several shades.

How to buy them. Both epoxy and latex concrete are available in handy-size kits for small jobs around the home. The latex type comes in a two-part package containing a sand-cement mix and the liquid latex. You can also buy the liquid latex separately and mix it with regular cement and sand or with packaged sand-cement mixes like Sakrete.

Epoxy concrete comes in two- or three-part kits containing the epoxy resin, sand, and hardener. You mix up only as much of either type as you can use in about an hour because of its quick-setting properties.

Neither type is cheap compared with regular concrete, but it pays for itself in doing jobs that regular concrete can't do. Also, as a resurfacer, so little is needed that you may actually end up spending less for a thin topping of epoxy or latex concrete than you would for a whole new layer of regular concrete. The latex type costs about \$2.25 for a 5-pound kit, \$4 for a 10-pound kit, and \$10 for a 40-pound kit—or about 25 to 45 cents a pound depending on the quantity you

Home Improvement Ideas

Some jobs you can do with the new concrete patching compounds



SETTING FLAGSTONE



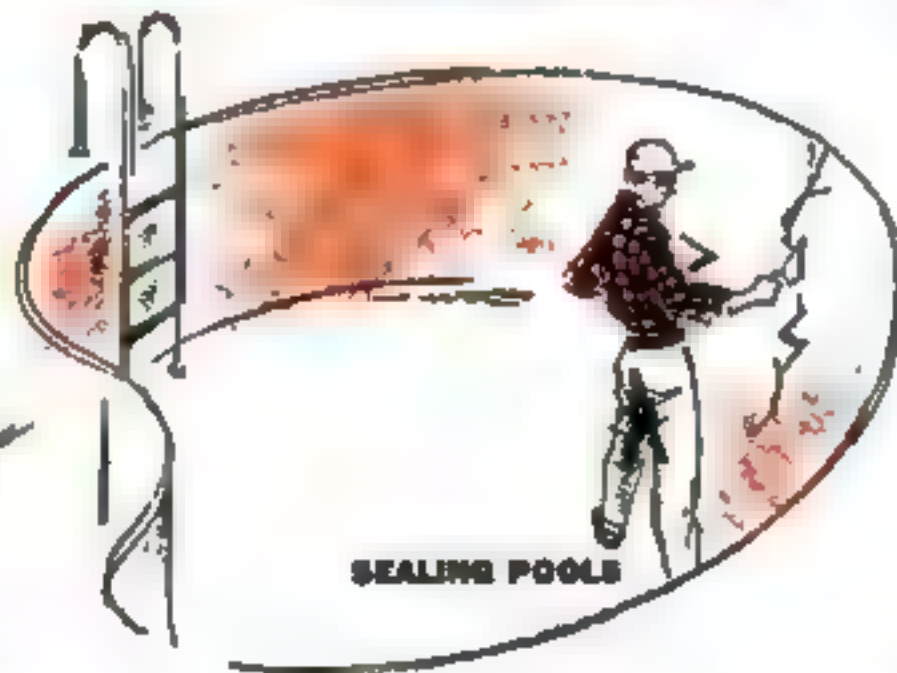
INSTALLING RAILINGS



PATCHING SHOWERS



JOINING PIPE



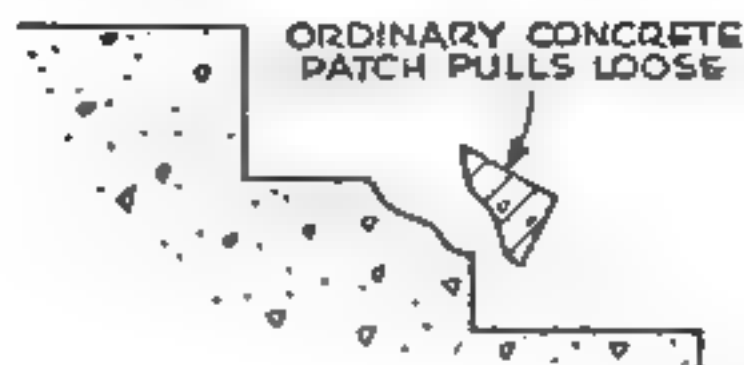
SEALING POOLS



RESURFACING OLD FLOORS

CONTINUED

Patching a broken corner on a cement step is now a cinch



buy. Each pound of mix will cover one square foot $\frac{1}{8}$ " thick. The liquid latex, bought separately, costs about \$4 a gallon—enough to make 40 pounds of mix.

The epoxy concrete runs a little higher. It sells for 70 to 75 cents a pound, and each pound of mix covers a little less than one square foot $\frac{1}{8}$ " thick.

How you use them. Practically no preparation of old concrete is required for patching except to clean away dust and loose particles. Badly oil-soaked spots, such as in a garage or around machinery, should be washed first with detergent and then etched with a solution of muriatic acid or the patchers may not bond properly. When using the latex type over very porous areas, it's advisable to wet down the concrete first, as you do for ordinary patching, to prevent too-rapid absorption of the liquid in the patcher.

When patching cracks, you don't have to undercut the edges to lock in the patch. The new patchers cling so tenaciously that they can be applied directly to outward-flaring cracks, shallow depressions, and exposed edges and corners, such as on steps, without danger of their pulling loose. There's no need to overfill a patch to allow for shrinkage, either, because the new patchers don't shrink.

The epoxy type has a somewhat higher tensile strength than the latex and also is unharmed by acids, oils, solvents, and other chemicals. The latex type is not recommended for use where it will come in prolonged contact with solvents such as naphtha, alcohol, or gasoline. Wet con-

crete should be allowed to dry thoroughly before applying either type of patch.

Special patches. In addition to the regular patching compounds, both latex and epoxy concretes are available in forms made especially for resurfacing old floors. Another special type is a bonding agent made for sticking new concrete to old concrete where a patch is so large that it is necessary to use regular concrete instead of a latex or epoxy patcher.

One type of latex floor resurfacer comes in fine and coarse grades. The fine grade can be laid up to $\frac{3}{8}$ " thick in a single layer and the coarse up to 1" thick. The coarse grade is more economical for thick fills and more resistant to wear. New flooring can also be built up in two layers, with a thin fine-grade topping over a coarse base.

Latex concrete was pioneered by the Camp Company of Chicago several years ago and is now being sold by a number of other companies under such names as Latex Concrete Patch, Latex Cement Patch, and Latex Concrete Repair.

Epoxy concretes are available under such trade names as Epo-Surfacer, Epoxy-Floor, Nu-Pon Cote, Epo-Crete, Epoxy-Tred, Nu-Klad, Armor-Crete, Floor-Nu, Epoxy-Crete, Sta-Crete, Chemcrete, Plastic Mastic, Permatop, Relpatch, Duratrem, Epoxyn-Patchcrete, Industro-Floor, and Wonder-Crete. One of the major developers of epoxy concrete was General Mills.

Both epoxy and latex patchers can be obtained at paint and hardware stores, lumber yards, masonry-supply houses, and flooring dealers.



How to Turn a Bird Bath into a Patio Table

WHEN our bird bath isn't for the birds, it's for us. We remove the bath and put on a circular plywood top that serves as a wonderful table for games or back-yard snacks. The top is $\frac{1}{2}$ " thick and 3' in diameter, with a tin can bolted to the

center that slips into the hole in the bird-bath pedestal. If a can can't be found to fit the hole exactly, try using a smaller one wrapped with plastic or rubber electrical tape to make it snug.—Arthur R. Tanner, Poughkeepsie, N. Y.

Aluminum Forms for Steps

TERRACED steppingstones can be attractive when they are made by pouring colored concrete into these simple forms. A minimum of spadework, a few stakes, and some 4"-wide corrugated aluminum strips are all that's required. The strips are sold at hardware or garden stores for edging flower beds. You can form a great variety of shapes with them, and they're easy to strip off when the concrete has set. They can be re-used, and they leave a pattern on the edge of the steps that suggests chisel-hewn building stone.—Clifton Brown, W. Springfield, Va.





HOW TO

Survey Your Lot

Tape, string, and a mailing tube can keep you from invading your neighbor's property

By Phil McCafferty

BEFORE you erect a fence, lay a retaining wall, or plant border shrubs, it's a good idea to know the boundaries of your plot.

Perhaps you'd just like to know where to stop cutting the grass. Or how to improve the grade for drainage.

This information is on the lot survey plan you got when you bought your home. The trick is to spell it out in feet and inches on your property.

Do-it-yourself surveying, handled with reasonable care, is accurate enough for most jobs around your grounds.

Only when you add to or sell your house do you need a pro to pinpoint dimensions to a fraction of an inch.

You'll need a 100' tape, stakes, mason's cord, and your lot survey plan.

A mailing tube, rigged for sighting, is helpful on a windy day or when the cord must pass through shrubs.

Begin by laying out dimensions from the building to the lot lines, then work out other dimensions as shown in the photos. If you have a sidewalk, and dimensions aren't given, a call to the city engineer will establish the distance from sidewalk to property.

New lots often rate a semipermanent stake marking one corner, and there might be others placed at the time of the original survey. As you measure out the corners, look around carefully for these markers.



1 **SIGHT THROUGH MAILING TUBE** along house side to establish a straight line to the front (see 1 in drawing). Signal a helper to move left or right until the stick he (or she) is holding is "on target." Hold stick or mark the spot.

If you find one or more, you'll know your survey is accurate. Protect these by embedding them firmly or by replacing them with permanent markers.

Although each lot gives rise to its own surveying problems, here are some tips to help you over the rough spots:

- Don't get flustered if your front lot line appears to give the town most of your front lawn. It probably does. As much as 15 to 20 feet back from the curbing can be public property.

- House-to-lot-line dimensions are usually measured at right angles to the lot line.

- Dimensions from the house are from the foundation, not the siding.

- To double-check your survey, try to

4 **STAKE OUT A PERPENDICULAR** by triangulation and sight over stakes to establish points C and D on plan. Follow the same procedure to double-check corner D from front-line point A, then turn around and sight to point E.



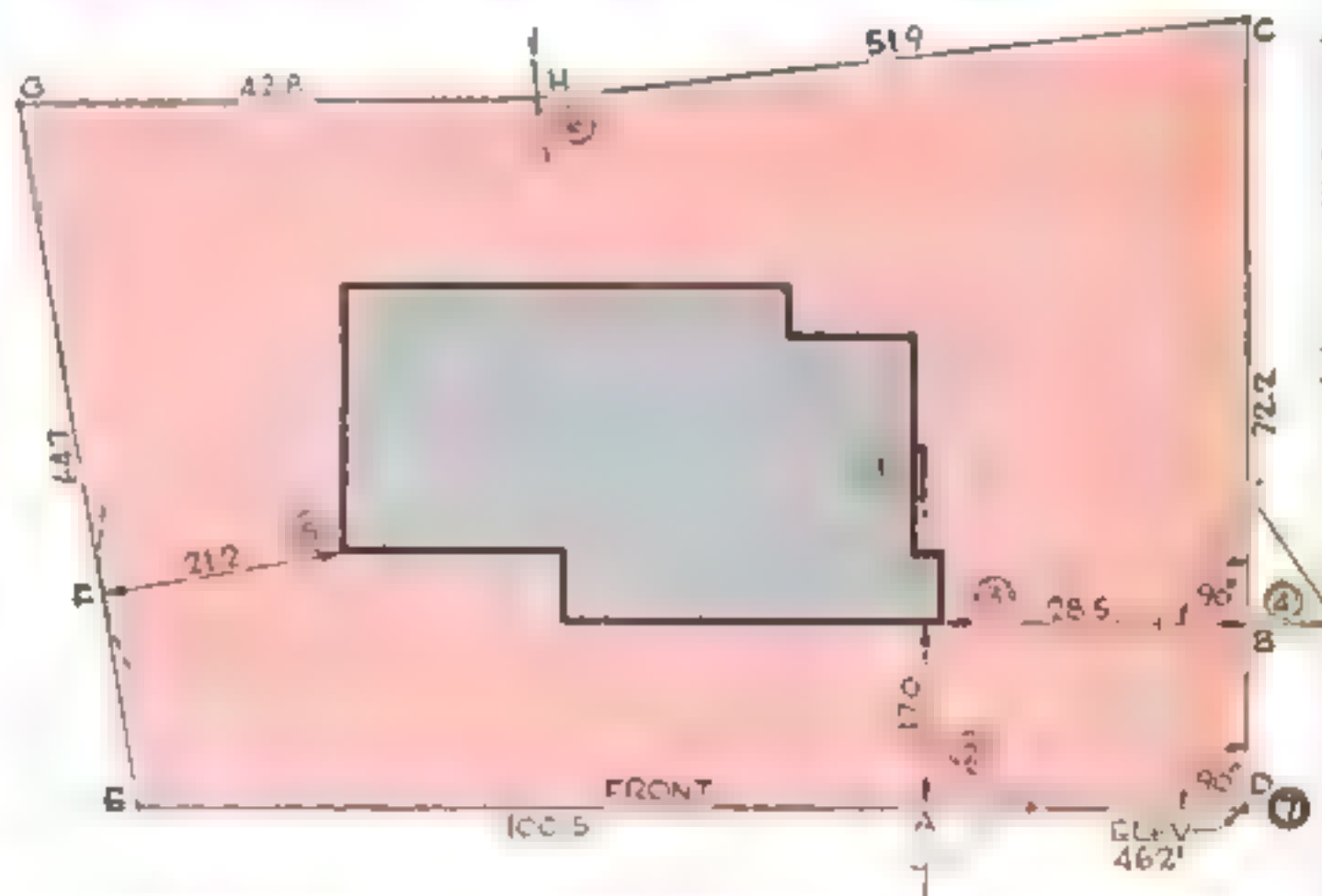


2 MEASURE toward the stick from the house to establish the front line. Take measurement from the foundation rather than the siding, which invariably overhangs the concrete. Hold the tape level if the ground slopes.



3 WHEN THERE ARE NO OBSTRUCTIONS, check by eye to see that tape is run out parallel to house, as in this photo showing measurement being taken to side of plot. If wind blows a curve in tape, use sighting-tube method.

TYPICAL PLAN of lot survey defines lot size, specifies square corner, and shows location of house on lot. Also on many plans, but not shown here, are angles of corners other than square, and elevations indicating grade at various locations on lot.



5 SWING AN ARC FROM THE HOUSE to locate point F. Then, from point E, sight over part of arc F farthest from house, and measure from E to fix point G. A slight inaccuracy in sighting can affect G, so repeat several times.

6 CLOSE THE PERIMETER by swinging a measured 42.8' of cord from G and 51.9' on the tape from C. The spot where these measurements come together establishes H. Try to locate an original survey marker in this area.



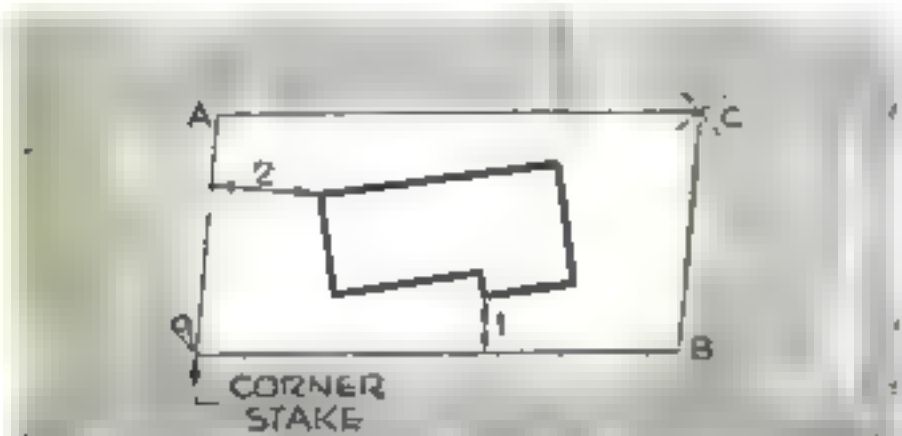
get your neighbor interested enough to bring out his survey plan. It might readily establish some points not clearly shown on your plan.

- Lot dimensions are generally given in tenths of a foot. Multiply each tenth by 1.2 to get exact inches, or figure it as

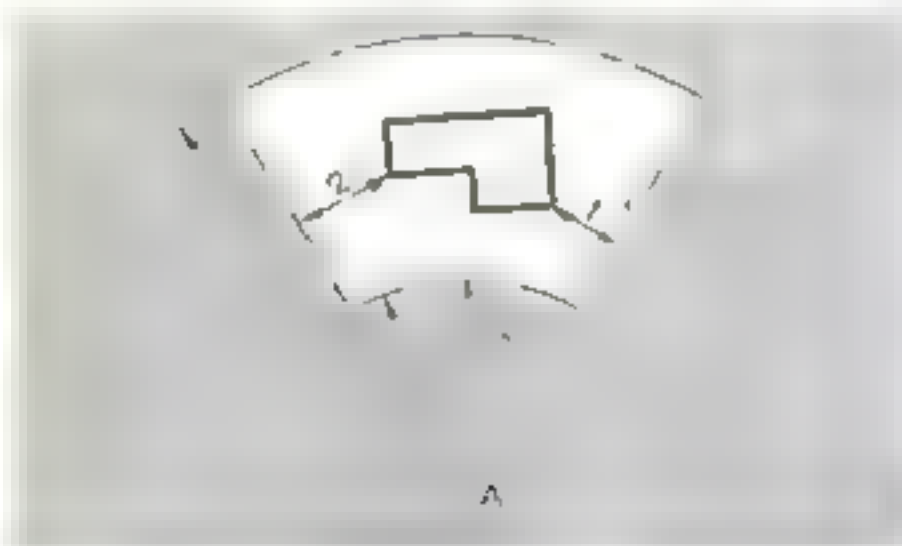
about 1-3/16". (The 64.7' on the plan shown comes to 64' 8-6/16" or 64' 8-5/16", depending on which scheme you use.)

- Property-line fences must be *all* on your lot, even concrete footings. Driveways often must be a minimum distance from the line. Check your local code.

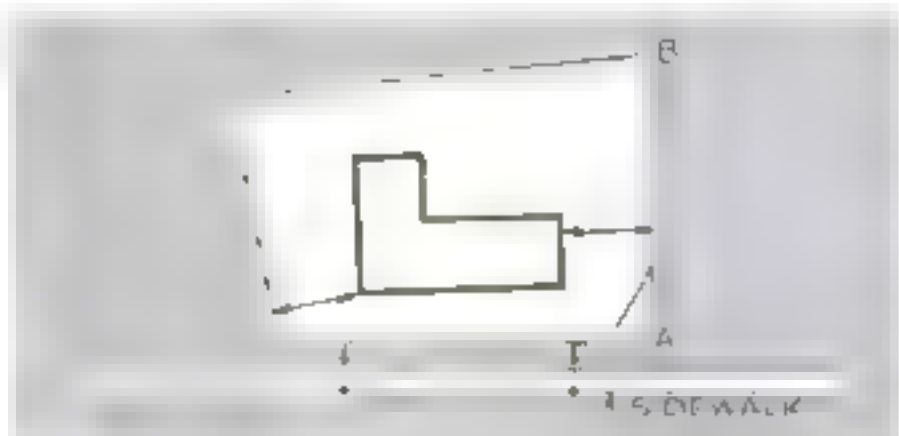
Useful tips on home surveying



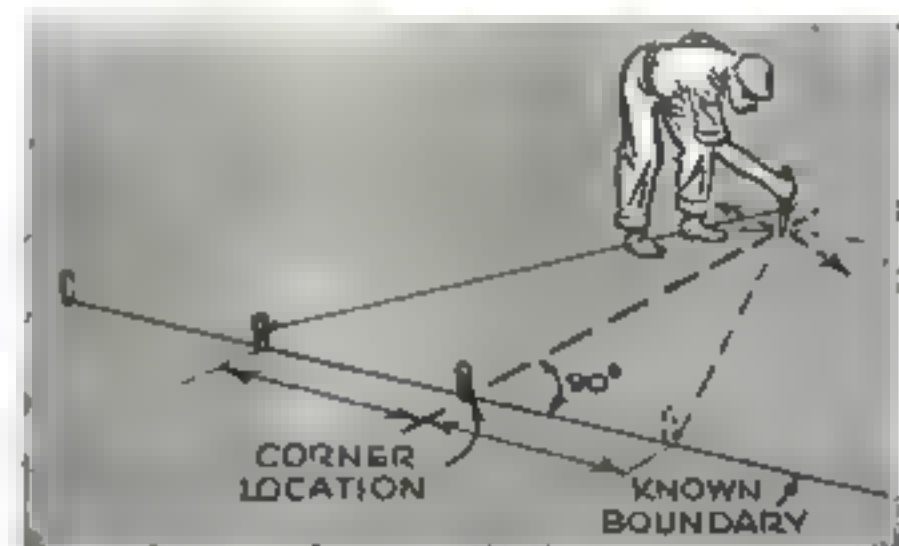
FINDING A CORNER STAKE makes only one front measurement necessary. Swing arcs at 1 and 2, sight over them from the stake and measure to find corners A and B. Measured arcs swung from points A and B then establish corner C.



PLOT A RADIAL LOT by swinging arcs and erecting perpendiculars at 1 and 2, from which center of circle is sighted at A. Long arcs from A give curved front and rear boundaries. Curved sidewalk could help determine radius.

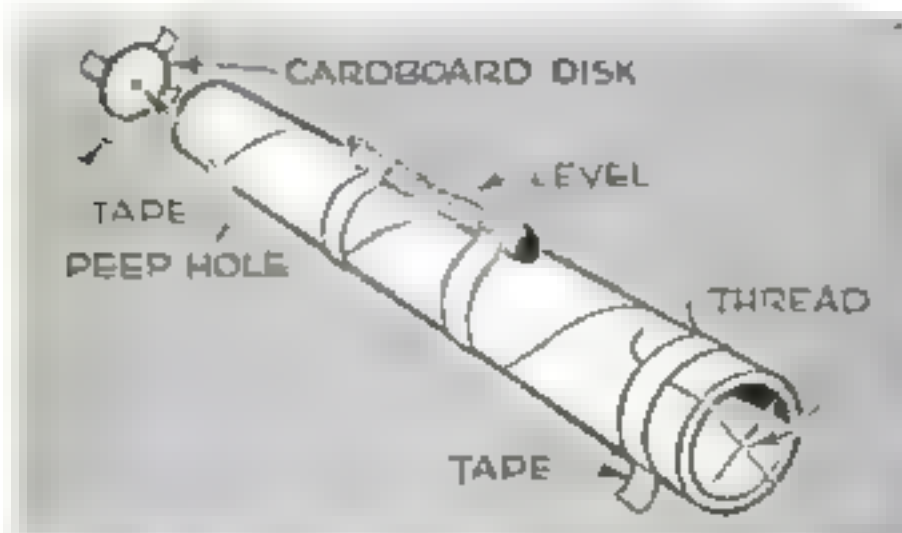


A SIDEWALK, usually parallel to the front lot line, establishes front line when sidewalk-to-plot distance is known. Swing arcs to set front line, erect perpendicular at A, and sight from A to B to find the side line.



TO ERECT A PERPENDICULAR from a point on a base line, measure any equal distance in both directions from point. Swing arcs of equal radius from these points and drive a stake where arcs meet. Dotted line will be perpendicular.

How to make a sighting tube



A MAILING TUBE—several feet long—fitted with a peep hole in one end and cross hairs in the other, is excellent for sighting straight lines. A small level, taped on the tube, helps hold the sight level when finding elevations.



Prop the tube on a sawhorse as above or fasten it to a camera tripod, and sight on a folding rule held by a helper. Difference between tube centerline to ground and dimension sighted on rule is relative elevation.

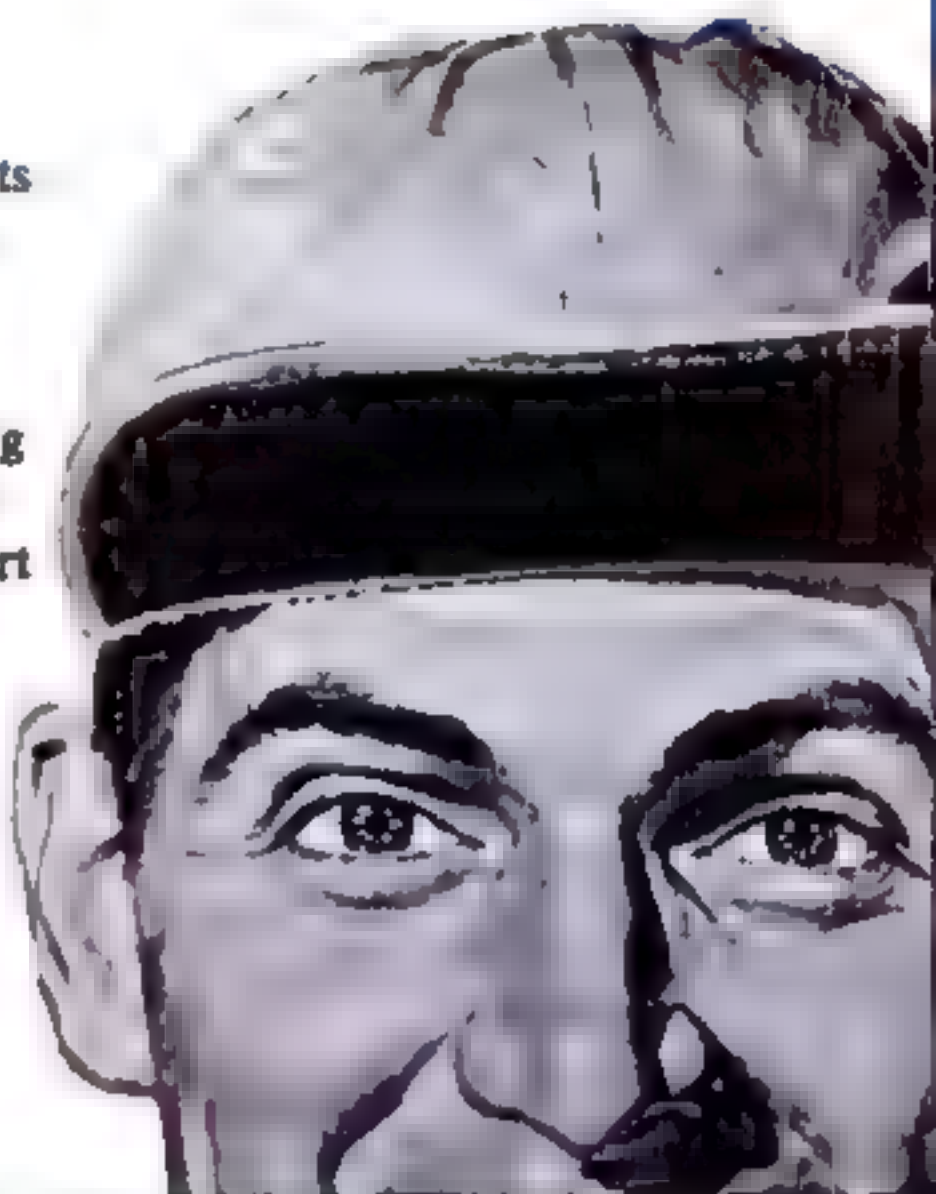
How to add *Lasting* value to your house by remodeling with **RUBEROID®**



A remodeling job is one of the most important investments you'll ever make. It will affect not only the comfort and safety of your family but it will also affect the re-sale value of your house.

That is why it is so important to invest in quality building materials when you remodel in order to assure dividends for years to come in terms of beauty in your home, comfort and increased re-sale value.

On the following pages are three important examples of how quality Ruberoid building products can make remodeling jobs easier and, at the same time, add lasting value to your house.





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with Ruberoid Dura-Color® Asbestos Siding

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Your house will always look brand new with Ruberoid Dura-Color Siding.

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The result: durable sidewalls that will never wear out, never need maintenance—beautiful siding that reduces painting bills because the colors are preserved in plastic. Your Ruberoid Dealer can show you how easily and economically you can add extra beauty and lasting value to your house with Dura-Color Siding.

HIGH FASHION COLORS

CASCADE GREEN

REEF CORAL

SUNLIGHT YELLOW

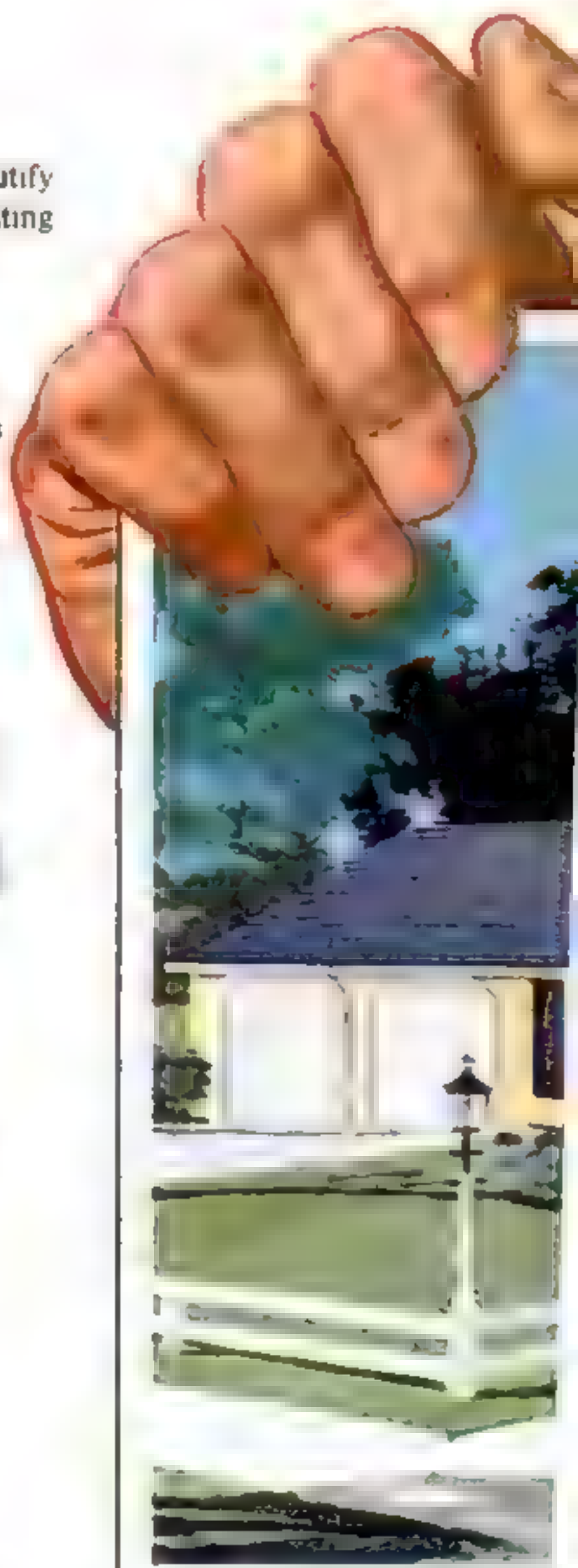
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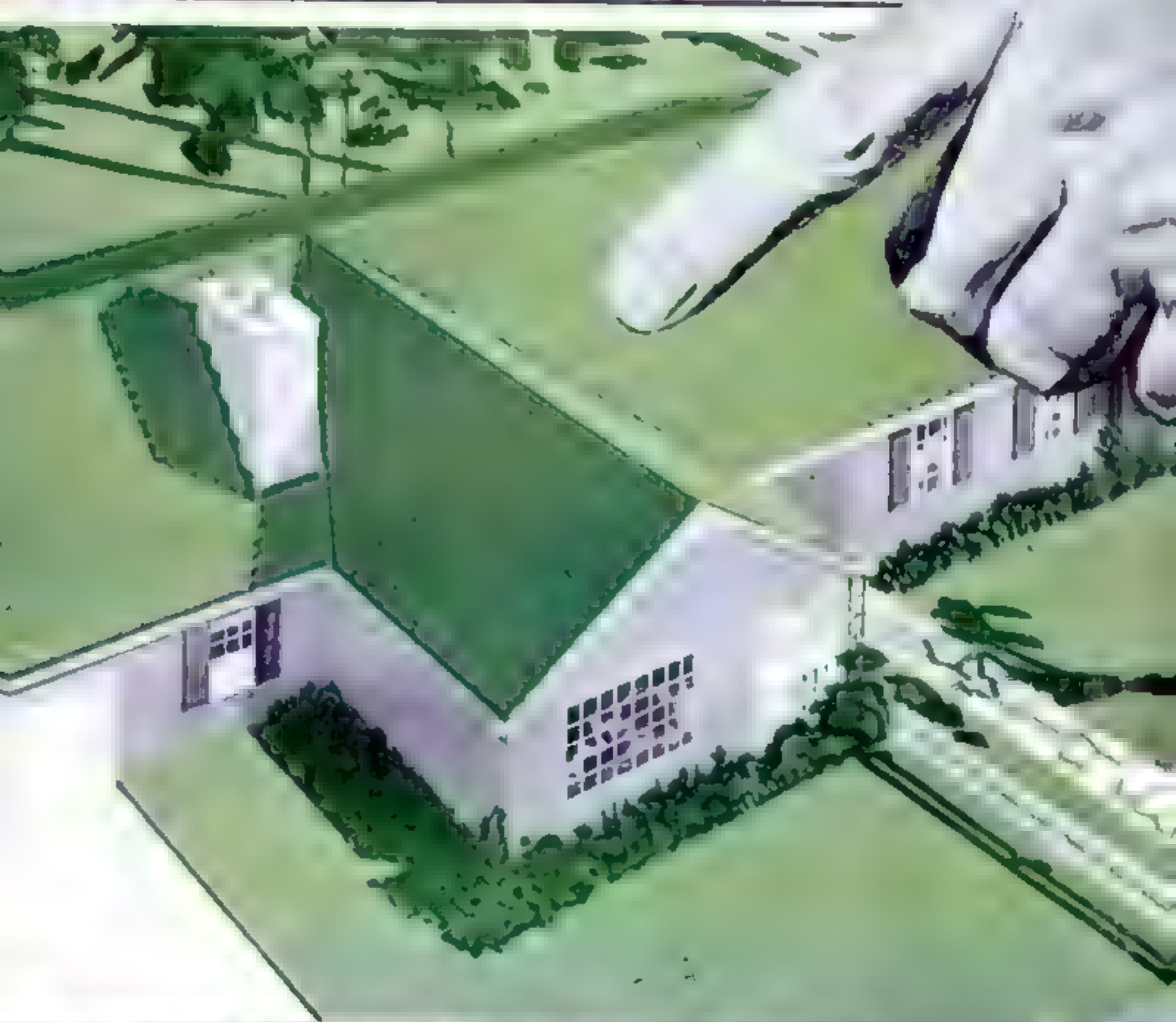
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102 POPULAR SCIENCE APRIL 1961







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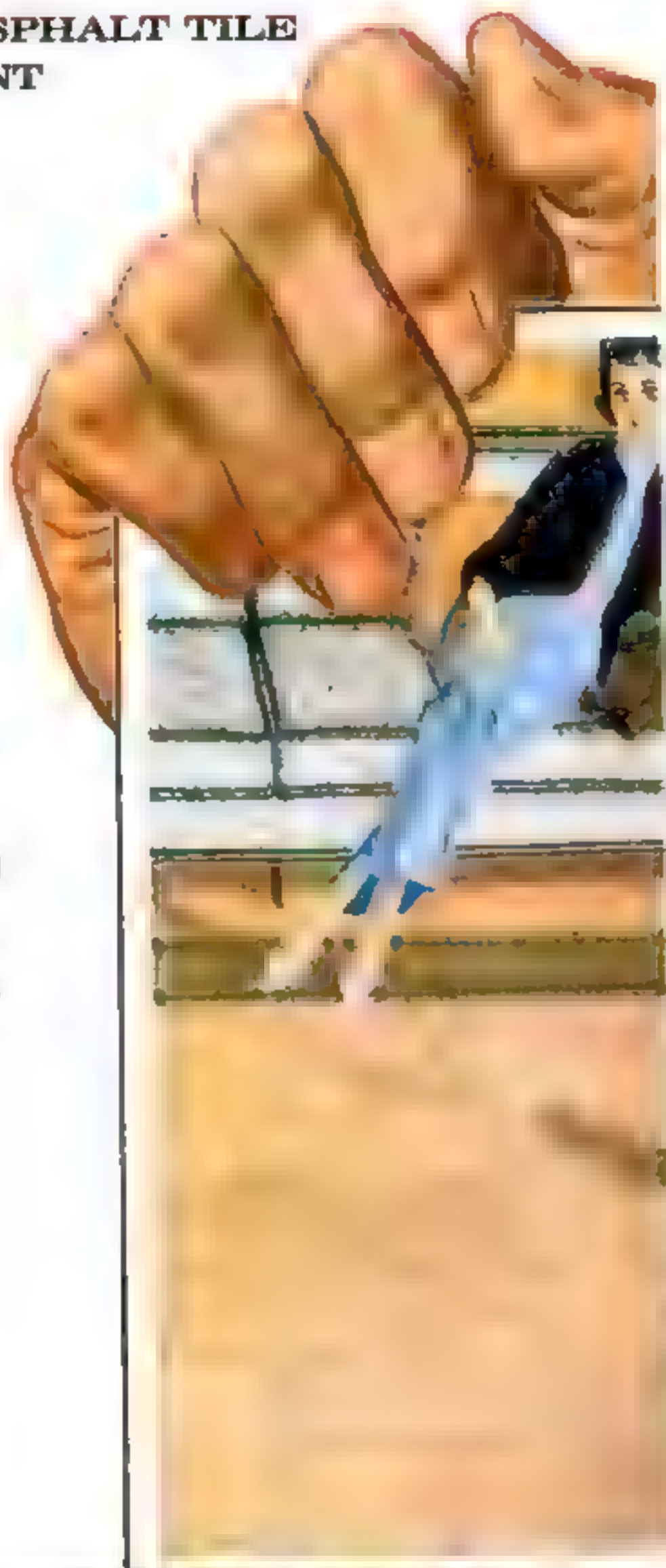
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The RUBEROID Co., P. O. Box 129,
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Landscaping Your Roof Line

OFTEN it's a roof that needs landscaping more than a yard. A few trees and shrubs will do wonders to soften a long, harsh roof line or make a square house look less boxy, as you can see in the "before" and "after" photos above. Be sure you know the height you need before buying or moving new trees.

Tie strips of cloth to a long pole at various levels and take sightings from different points in your yard. The

closer to the house you go, the taller the trees must be. Often just moving short trees farther away will do the trick. Trees should appear taller than the house, but not so tall as to dwarf it.



Landscaping Your Lot to Control Water Runoff

By Bernhard A. Roth and Lester Fox

NEARLY half a million gallons of rain water fall on the average half-acre suburban lot every year. The effect can be devastating. This great mass of water may run off too rapidly—or too slowly. Either way, you're apt to have several problems, sometimes without recognizing their cause.

The amount of water that flows over your property—you can determine this from the formula at right—may astonish you. A washed-out lawn or a flooded basement are obvious evidence of poor water runoff, but often a dried-up flower garden can result from the same cause in reverse. When rainfall isn't properly controlled, you get too much in one spot and not enough in another.

By using techniques developed by the U. S. Department of Agriculture, you can put water where you want it. You actually apply the same basic methods to your own home that have been used successfully by soil conservationists to stop floods and promote fertile soil in the country's great farm

and forest areas. You become, in a small way, your own soil conservationist.

The objective, contrary to much popular belief, is not just to get water to drain off your property. That way, you lose precious moisture needed for good lawn and plant growth and pass the problem onto your neighbor.

The real aim is to make water stay on your property, but distributed evenly so not too much can collect in any one spot. This way, you put moisture to work improving your property and become a good neighbor to others.

Whenever water is allowed to run fast, it causes damage. It cuts paths that quickly become tiny rivers. The river beds, in turn, collect new water and carry it off without giving it a chance to soak into the soil. If the rivers flow toward your house, they're

likely to end up in your basement. If they cross your lawn, they wash away seeds and topsoil. Soon, there's no lawn.

Absorbing excess water. A thick mantle of turf is the best defense against runaway water. It acts like a huge towel over your property, sopping up raindrops where they fall and allowing them to seep slowly into the ground.

Be sure to follow the recommended procedures for seeding, liming, feeding,

How Much Rain Falls on Your Lot?

Look up the annual inch rate for your locality (the annual average is 30 inches). Then use the following formula:

$$\begin{array}{c} \text{gallons of} \\ \text{water per} \\ \text{cubic foot} \end{array} \quad \text{INCH RATE} \times 3,630 \times 7.4 = \begin{array}{c} \text{TOTAL} \\ \text{GALLONS} \\ \text{PER ACRE} \\ \text{EACH YEAR} \end{array}$$

cubic feet of
water per acre
for each inch
of rainfall

The result is the number of gallons of water that fall on each acre in your neighborhood every year. Scale this to the size of your own property ($\frac{1}{4}$, $\frac{1}{2}$ acre, etc.) to find how much you get.

Bernhard A. Roth and Lester Fox are members of the U. S. Department of Agriculture Soil Conservation Service at Upper Darby, Pa.

BUILD YOUR OWN VACATION HOME



Get this free booklet from your lumber dealer



This colorful, 16-page booklet describes 10 mountain or waterfront homes designed by leading architects for low-cost, easy construction. Each can be built at a cost that's little more than what you are probably now spending for vacations and weekend trips. Some are expandable and can be constructed in stages to fit your budget. All use readily available standard lumber products.

Your local lumber dealer will help you select the right materials and methods. See him for your free booklet. If he is unable to supply you, write to Western Pine Association, Dept. S-1, Yeon Bldg., Portland, Oregon, giving us the name of your dealer. Enclose 10¢ for handling and mailing.

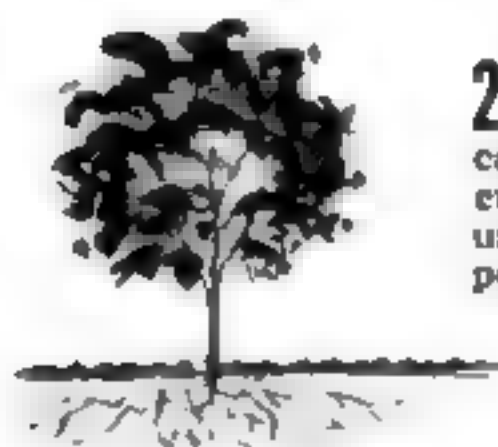
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5 Ways You Can Control Water Runoff

1 A THICK TURF: Water droplets cling to grass blades and are channeled into the soil instead of rushing downhill to erode the ground.



2 ADD MORE TREES: Also shrubs. Leaves catch rain; roots loosen the soil so it soaks up moisture; earth pockets collect water.

3 CONTOUR PLANTING: Arranging plants crosswise to a slope, instead of along it, provides rows of water-collecting ridges in soil.



4 TERRACING SLOPES: Breaking a slope into steps provides more usable level ground and creates flat areas that slow down runoff.



5 MAKE A LILY POND: Water drained safely into a small pool saves damage to the rest of the yard and adds a decorative touch.



weeding, and watering your lawn—the thicker the grass, the more water it can hold. And don't let those bare spots get ahead of you—they're an invitation to runaway water.

Heavy or compacted soil is also a speedway for running water—the drops just can't get through it fast enough to stick around. The roots of grass and other plantings help loosen hard-packed soil, creating air and moisture passageways. Clovers are especially good because they have deep roots.

In very hard-packed soils, you may need to take more drastic steps. Plowing to a depth of five or six inches and turning under four or five tons of wood shavings, sawdust, or other cheap organic material will do wonders for a quarter-acre lot. The material rots quickly, giving the soil a fluffy texture that holds in water and promotes plant growth. An easier, though more expensive, way is to spread a few loads of topsoil over your property before planting a new lawn. Many modern homesites have been scraped bare of topsoil by bulldozers.

New way to grow grass. One of the toughest things to do is to get a lawn started on a bare, rain-swept slope—the seeds are washed away before they can get a foothold. Various types of mulch, such as hay, can be spread over the seeds to hold them in place, but this is a tedious job requiring chicken wire over the top to hold the hay in place. And when the grass starts to grow, the whole business must be removed.

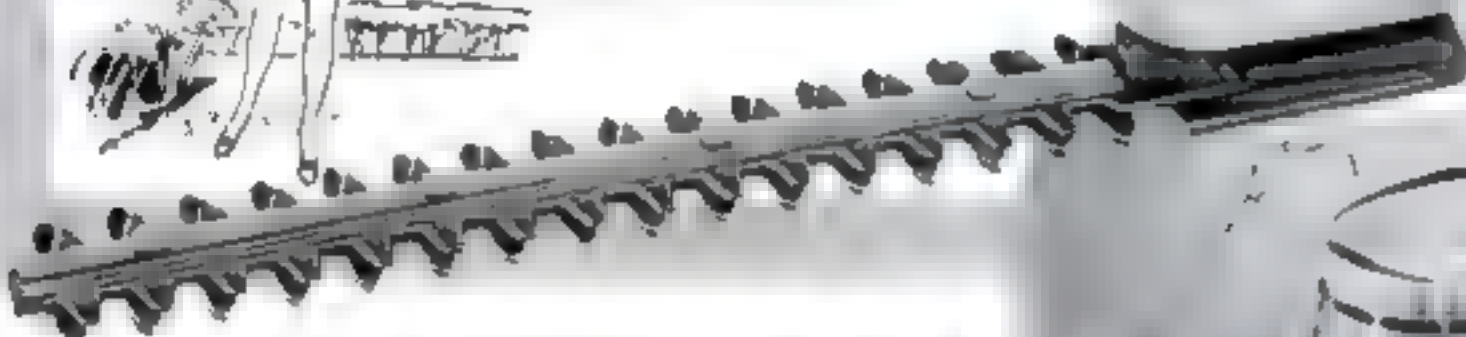
A simple new method, developed by USDA soil conservationists, makes use of jute matting to hold the seeds in place. The jute, the same stuff that's been coming for centuries from ancient India, forms a grid that keeps the seeds from washing away. You put it down only once and don't have to remove it. It rots into the ground after it is no longer needed and improves the soil.

The jute mesh is sold in handy small rolls containing 100 square feet by the Ludlow Mfg. & Sales Co., Needham Heights, Mass. A single roll, costing \$2.95, is usually enough to cover the worst patches in a suburban lot. The soil is prepared in the same way as for a regular planting except that it should not be rolled or machine-packed until after the mesh is in place. The mesh is laid

this Summer

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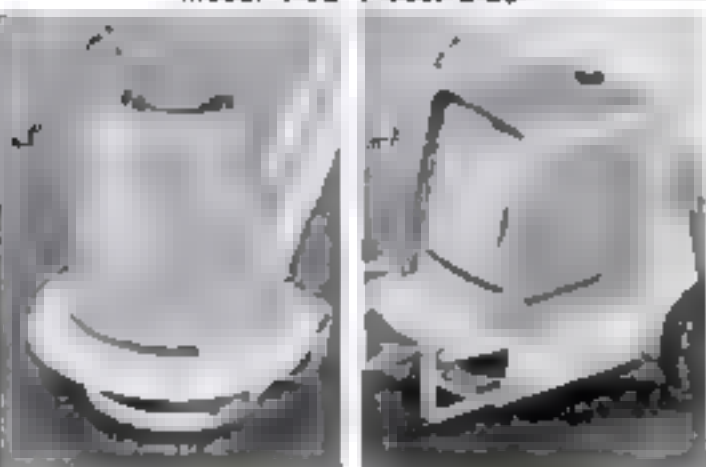
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Model 1370



Model E-65



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NEW USE FOR AN OLD MATERIAL: Jute matting laid over a rain-washed slope, is Department of Agriculture's latest technique for getting grass to grow on badly eroded soil. The uphill

end of the matting is embedded in a shallow trench, as in the picture at right, to anchor it. Matting is also pegged down every 6' to 10' with U-shaped staples bent from wire.

down in strips with the ends and edges overlapping several inches. It's important that the mesh hug the ground firmly so no water can get under it.

When the mesh is in place, plant half as much seed over the top as was used underneath, then roll the soil. Besides holding the seeds, the jute has been found to slow weed growth so the grass can get off to a fast, healthy start.

Contour landscaping. A good lawn goes a long way toward curbing water runoff, but it can't do the whole job. Water is bound to pile up during heavy storms. Notice where it accumulates and which way it runs during the next down-pour.

The lower portions of slopes take the worst beating since they receive the biggest and fastest flows. The trick is to break long slopes into several flat steps to slow the water down. You get a valuable bonus, too—more usable level space for patios and play areas.

If you don't wish to get into a hefty earth-moving project, you can accomplish the same effect by digging shallow grooves—called diversion terraces—crosswise to a slope. Only saucer deep and grassed over, they won't affect the appearance of your lawn, but will trap water and slow its pell-mell rush.

Plant flowers, shrubs, or hedges in rows crosswise to the slope for the same reason. The ridges between the rows act like miniature dams, holding water for

use by the plants instead of letting it run downhill. Where you have more than a few inches between rows, plant the strips with grass—bare patches are ready-made spillways.

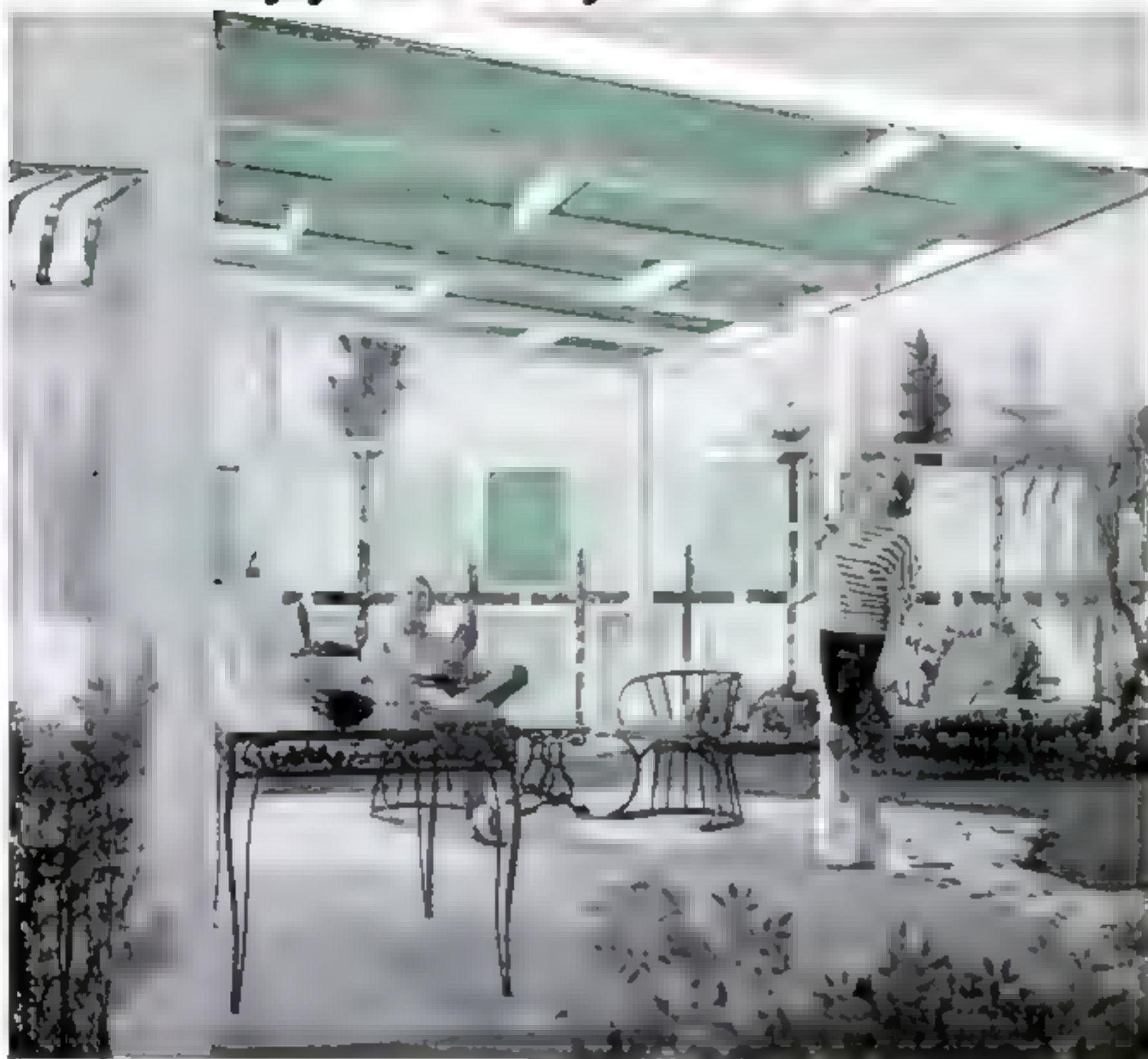
The more trees, bushes, and flowers you can add around your home, the better you'll be able to control water both in and above the ground. Leaves and branches hold a tremendous amount of water—as you know if you've ever sought shelter under a tree during a cloudburst.

Turn a problem into a pond. Where you have so much water that it can't be absorbed or drained, it's time to use the if-you-can't-beat-'em-join-'em approach. A small fish or lily pond in the back yard will serve as a storage tank for excess runoff as well as adding a scenic attraction. Drain pipes or ditches can be run to the pond from various parts of the yard to collect water.

Another solution is to create a "spreader" similar to those used by farmers. This is merely a low, flat spot in your yard where water can be collected without causing damage. The water is allowed to spread out into a broad, thin sheet so it will evaporate rapidly.

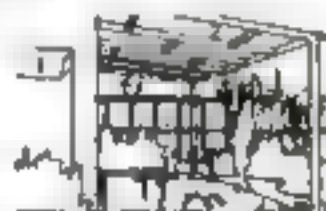
Trapping water on your own land not only saves harmful erosion, but is important to keep replenishing ground-water supplies, which are dwindling dangerously in many areas. Anyone who depends on water from a well doesn't have to be told this twice.

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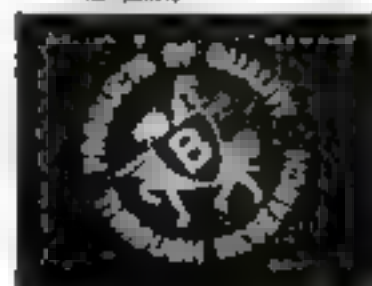


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THE CASE FOR Vertical Siding

By F. A. Strenge

The author is Publications Editor of the Dept. of Agriculture's Forest Products Laboratory at Madison, Wis. Working from data based on the laboratory's research, he determined the best method for applying board-and-batten siding to his own new home.



VERTICAL board-and-batten siding accents today's ground-hugging ranch and contemporary houses so well that it's becoming more popular than when the West was young. But it

has practical advantages as well as good looks:

- The joints between pieces run up and down, promoting better water runoff.
- Because comparatively short pieces cover a one-story house, joints between ends of pieces are not necessary.
- Each board is full thickness, unlike beveled siding, giving full insulation.
- You can use it rough-sawn, saving wood otherwise lost in planing—not to mention adding to its beauty.
- It is available in a wide range of sizes, grades, and kinds.

Protected by preservatives, and given a natural finish, so-called common grades of knotty lumber can be used. These grades are less expensive than the clear lumber generally used for siding.

About the only limitations on knots are that they be sound and tightly intergrown with the wood around them, and not over 2" in diameter. You can even use boards with the flaring grain patterns of flat-grained lumber when you apply a natural finish. If you plan to use paint, vertical-grained lumber is preferred, just as in other types of siding, because it holds paint better.

For proper installation, remember that flat-grained lumber shrinks and swells more than vertical-grained lumber. Lumber with knots may warp and split more than clear stock.

HOW MUCH WILL SIDING SHRINK?

This chart shows actual shrinkage, in inches, of green, foot-wide boards as they dry to various stages of moisture content.

	VERTICAL-GRAINED LUMBER			FLAT-GRAINED LUMBER		
	To 20% Moisture	To 12% Moisture	To 6% Moisture	To 20% Moisture	To 12% Moisture	To 6% Moisture
CYPRESS	.16"	.26"	.35"	.25"	.44"	.60"
CEDAR						
Alaska	12"	20"	26"	24"	43"	58"
Port Orford	.18"	.32"	.44"	.28"	.49"	.66"
Eastern red	.14"	.22"	.30"	.19"	.34"	.46"
Western red	.10"	.17"	.23"	.20"	.36"	.48"
DOUGLAS FIR	.20"	.36"	.48"	.31"	.56"	.74"
WESTERN LARCH	.17"	.30"	.41"	.32"	.58"	.78"
PINE						
Eastern white	10"	17"	22"	24"	43"	58"
Loblolly	.19"	.35"	.46"	.30"	.54"	.71"
Longleaf	.20"	.36"	.49"	.30"	.54"	.72"
Ponderosa	.15"	.28"	.37"	.25"	.46"	.60"
Shortleaf	.18"	.32"	.42"	.31"	.55"	.74"
Sugar	.12"	.20"	.28"	.23"	.40"	.54"
Western white	.17"	.29"	.40"	.27"	.53"	.71"
REDWOOD	.11"	.18"	.25"	.18"	.31"	.42"

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FROM

WEN

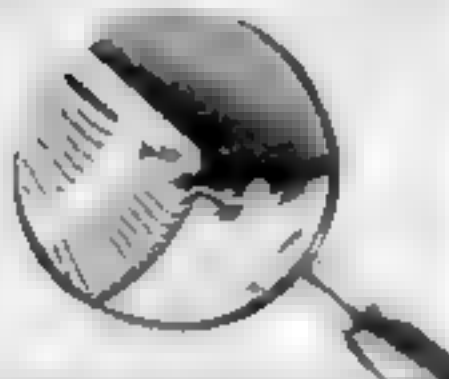
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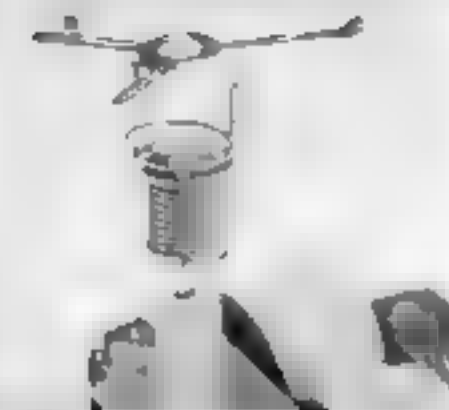
2

Comb-like slots guide whiskers into cutting area. Cutters shear smoothly at 20° as in fine scissors.



3

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4

Flexible cushion-spring drive couples motor to shaving head—no gears or complicated parts.

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The basic trick in installing board-and-batten siding is to space the boards apart. How far depends on the kind of lumber you use, how wide it is, and whether it is flat-grained or vertical-grained. The information in the chart on the first page can guide you. It shows how much 12" boards of various species suitable for board-and-batten siding will shrink, from the green condition to various stages of dryness.

In most parts of the country, siding will average about 10 to 12 percent moisture content year after year, increasing a few points in winter and dropping off in summer. If the edges of the boards are tightly butted, the boards will tend to buckle and split as they swell. Boards nailed along the edges will tend to split down the middle as they shrink.

Spacing siding boards will compensate for such movement. By nailing them on properly, you'll allow them to move as freely as possible. And by applying the battens correctly, you'll assure tight coverage of the spaces between the boards.

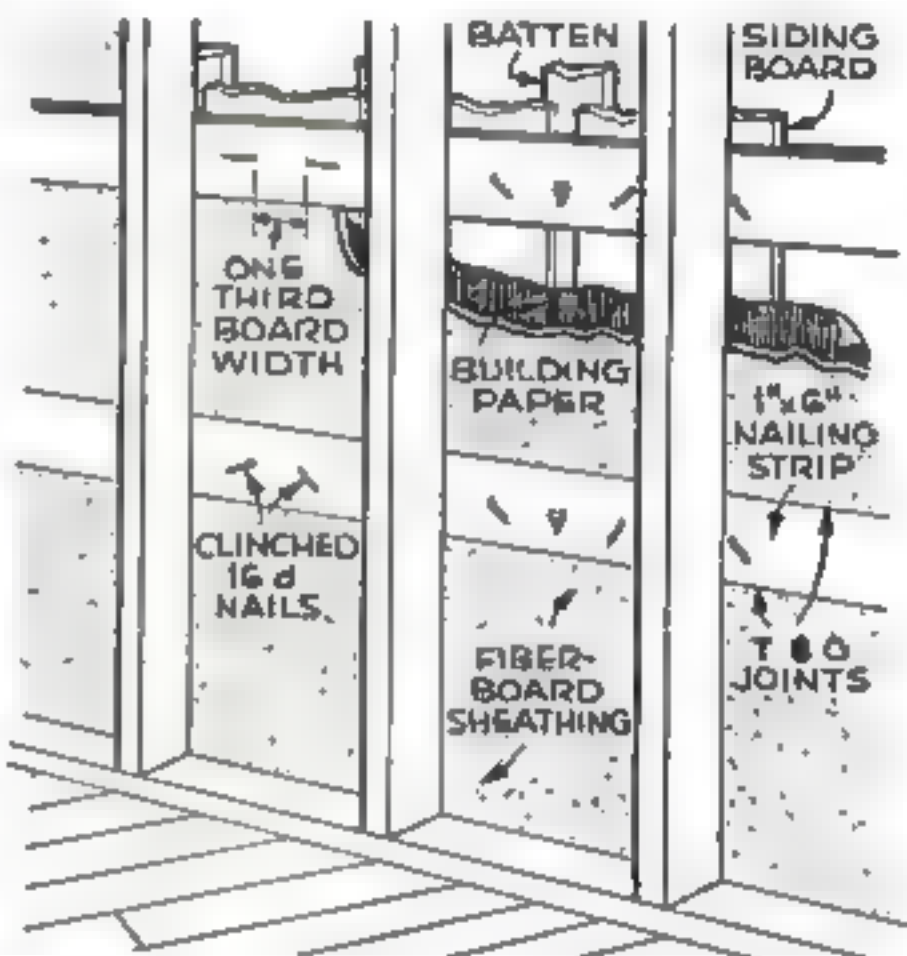
While siding can normally be expected to change only a few percentage points in moisture content during a year's time, the spread that the chart shows for shrinkage—between 20 and 6 percent—indicates a safe margin for spacing boards of a given species. Even for 12", flat-grained boards, the greatest shrinkage is less than half an inch.

A 1/2" space between boards is about the minimum for proper nailing of bat-

tens. Batten nails should be driven slantwise in pairs, so that they cross each other. Use at least 16-penny galvanized siding nails—larger ones if available, so that they can be clinched inside the wall. The construction shown calls for 1" sheathing under 1" boards, so 16-penny nails are also needed for the siding boards. Drive them in about one-third the width of the board from the edge—for 12" boards, about 4" in from the edges.

With 12"-wide boards spaced at least 1/2" apart, use 4" battens to assure adequate overlap; with 8" boards, battens can be 3" wide.

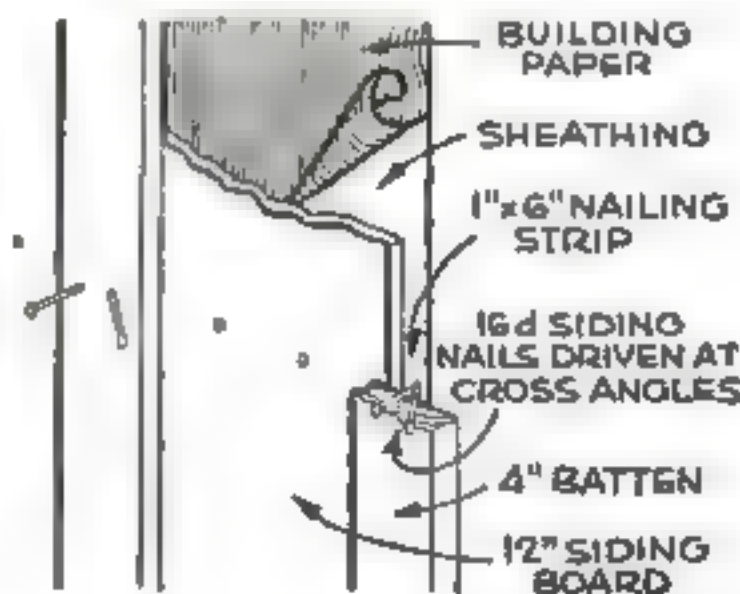
Whatever your choice of lumber, be sure it's well-seasoned. The extreme shrinkage of green wood can cause trouble.



INSIDE VIEW OF WALL shows siding applied before any interior work. Nails driven through vertical boards are clinched behind the nailing strips, between studs. If possible, clinch batten nails, as well. If no bottom nailing strip is provided, nail into sill or header.



BATTENS ARE CENTERED over gaps, as shown above, and nailed through them, not to the siding boards. Drive the nails at an angle of 10 to 15 degrees so that they cross before entering the nailing strip.



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Take this handsome fence of Sunline siding, for example. The board 'n batten's all in one, creates unusual, eye-pleasing sun-and-shadow effects. Even makes beautiful interior walls.

Or weave strips of Masonite hardboard in and out between posts for a unique woven fence. (Another idea: build a carport to match it!)

For something really unique, construct a "hanging garden" fence with Masonite Peg-Board. On one of your top Peg-Board panels, place your favorite plant...or several plants.

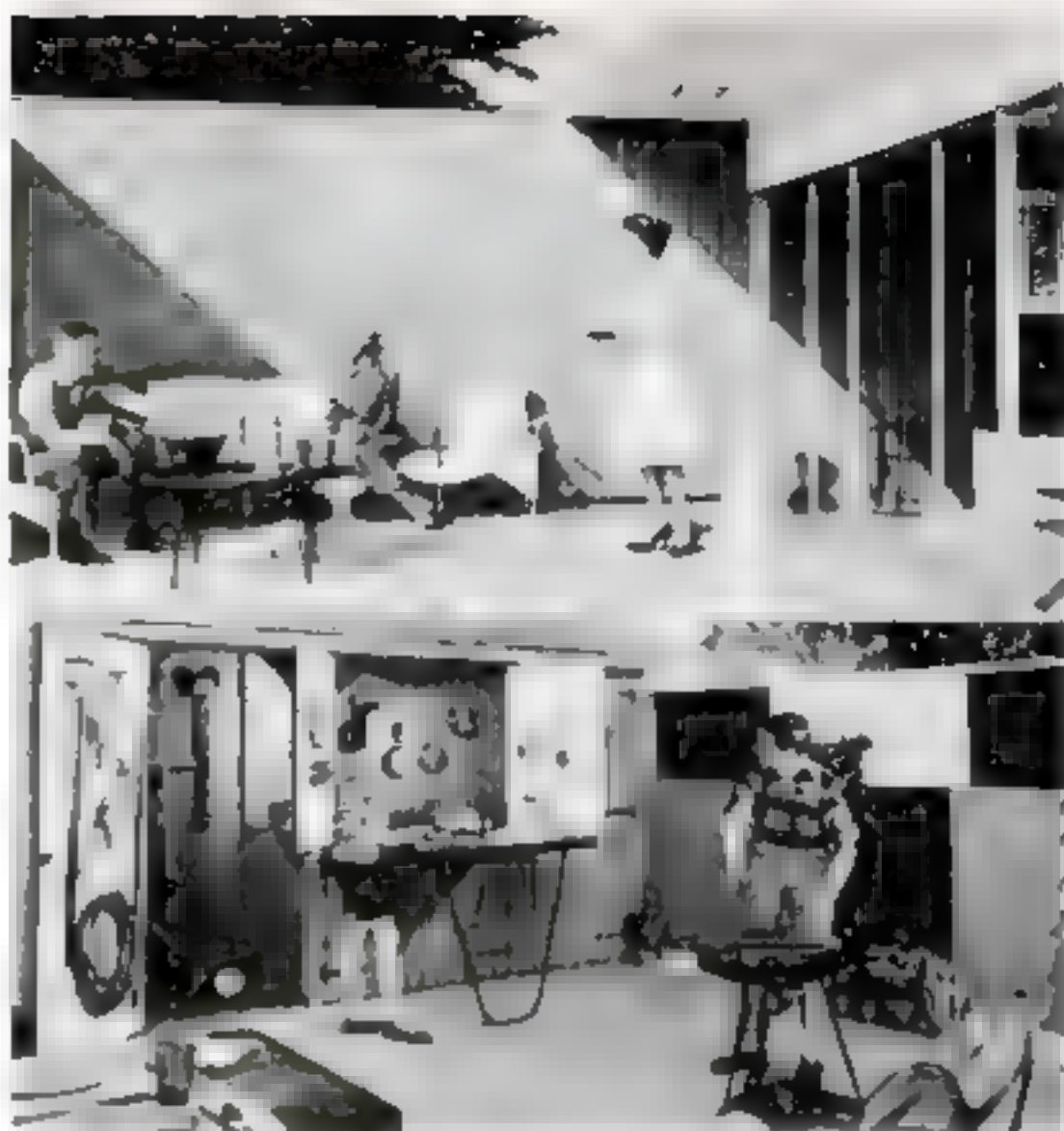
Rather than build a fence—*create* one! You start when you send for the booklet shown below—offers 20 ways to add new dimension...and privacy...to your yard. Write Masonite Corporation, Dept. PS-4, Box 777, Chicago 90, Illinois. In Canada: Masonite Corporation, Gatineau, Quebec.



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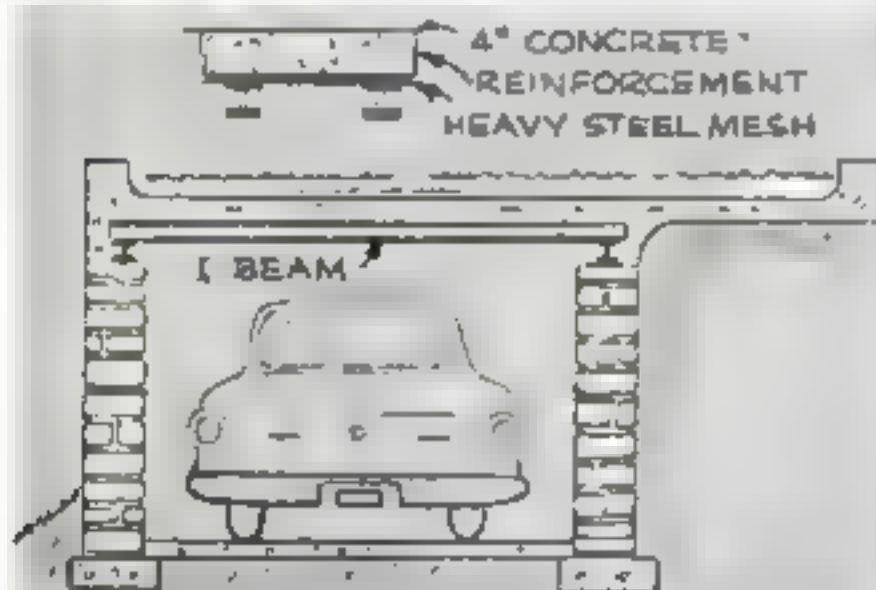
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Home Improvement Ideas

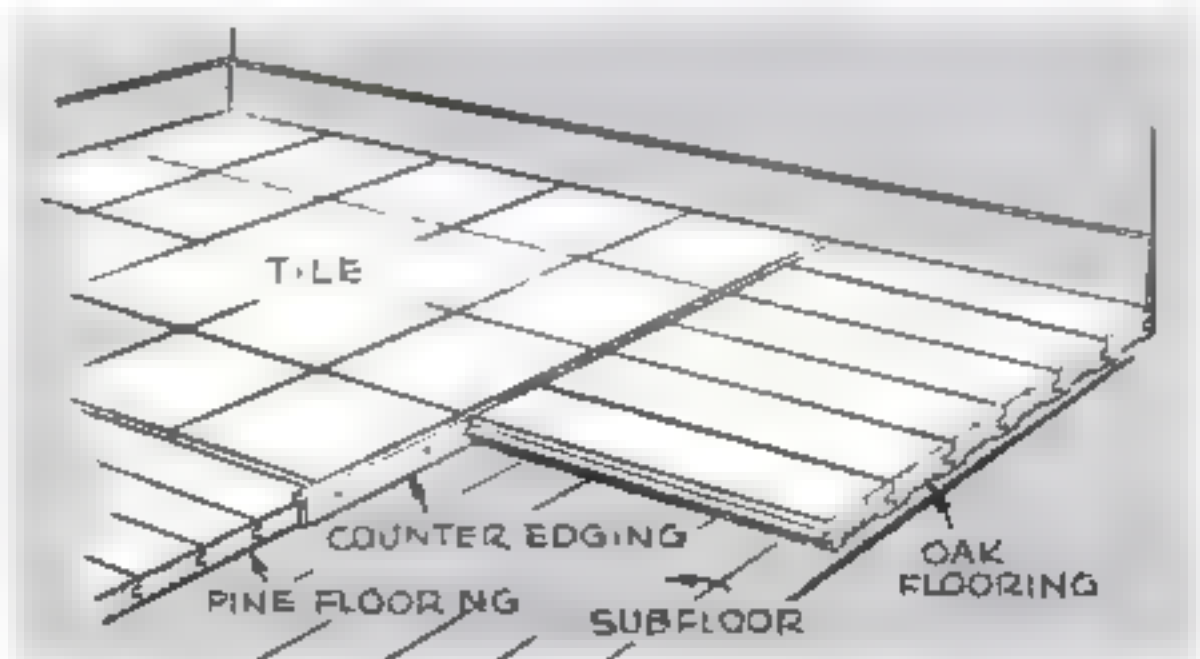
Scenic Fish Pond Sits Atop Garage Roof

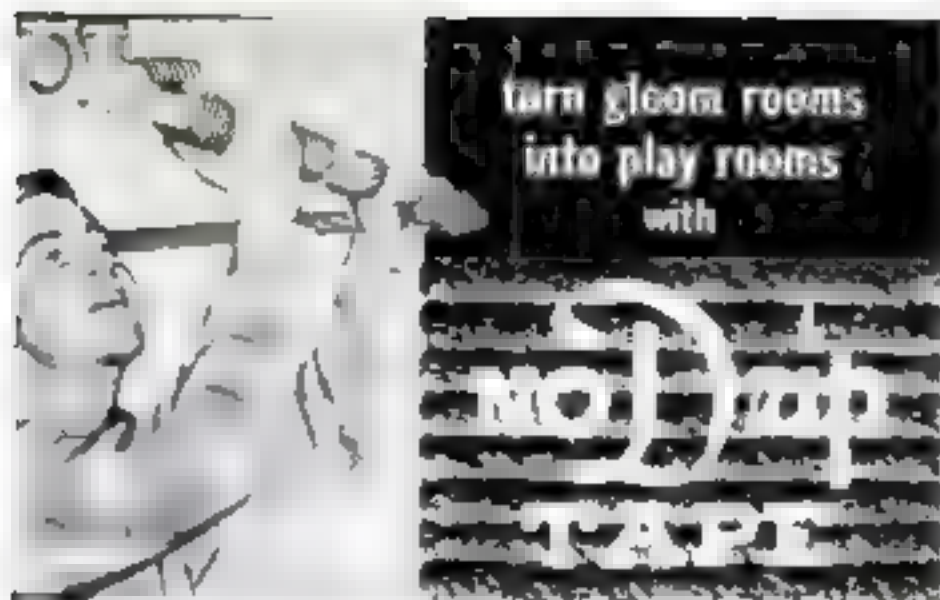
THERE WAS no space for a pool or a garage on this steeply sloping lot, but a bit of ingenious construction got the owner both in one—a garage with an attractive fish pond on top. The side of the hill was first scooped out to provide a level area, and masonry walls were built up at the sides. Steel I beams across the top of the walls support a heavy, fine-screen steel mesh, permitting a stiff concrete mix to be poured over the top. The concrete is reinforced and curved up 6" at the edges, providing a shallow recess for water. A soupy mix of cement was brushed over the pool bottom to waterproof it. Evaporation of the water and periodic refilling from a garden hose keep the pond fresh. Because the water depth is shallow, its weight is not a problem.—*Hi Sibley, Nuevo, Calif.*



How to Join Wood and Tile Floors

WHERE a tiled floor meets an oak floor, you can make a neatly level joint this way: Put down pine flooring under the tile and the combined thickness will match oak flooring. A strip of kitchen-counter edging overlapping the edges of the tiles will keep them from being kicked loose.





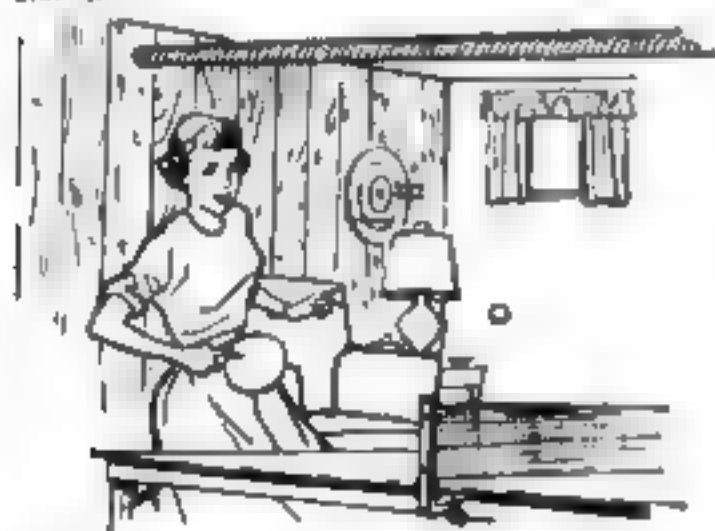
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IN ONE EASY APPLICATION



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applies in seconds...lasts for years!

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NoDrop Tape is a pliable, cork-filled 8-strand tape that forms a sealed pipe jacket immediately upon application. Absolutely no maintenance! At your favorite hardware or building supply store.

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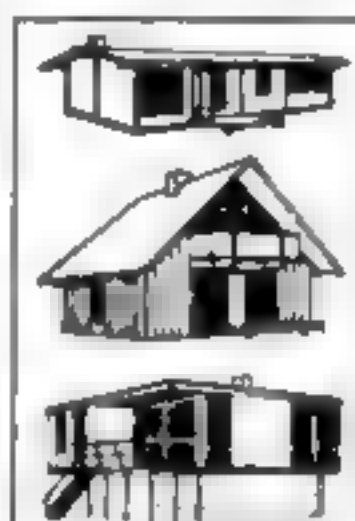
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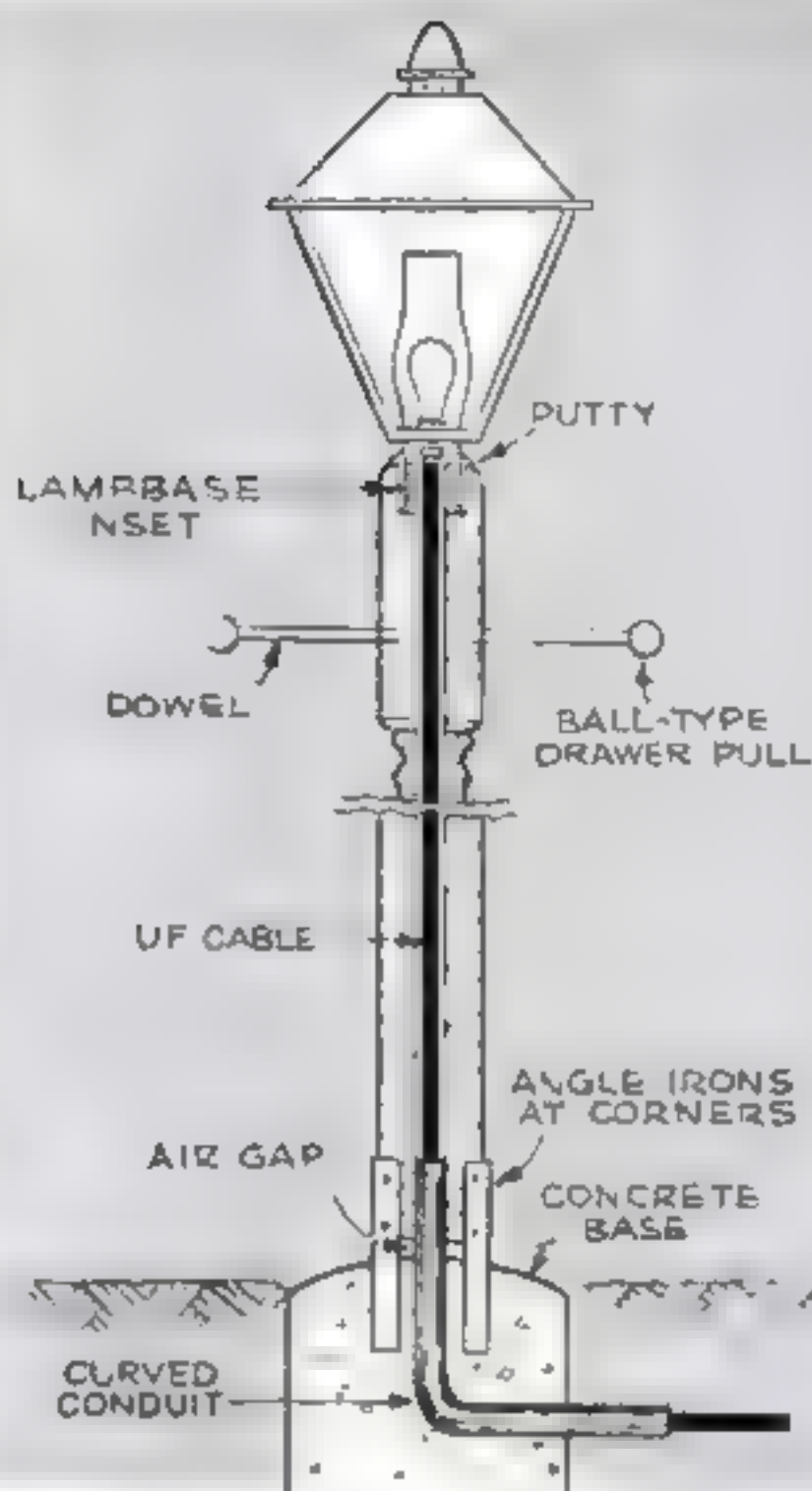
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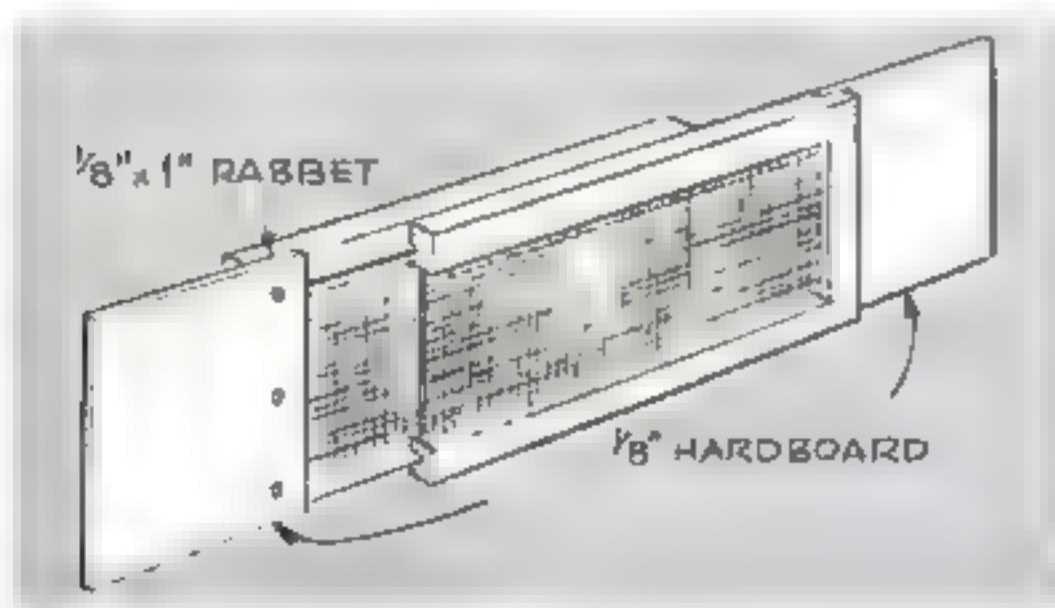
City _____ Zone _____ State _____



Attractive Lamp Post from an Old Porch Column

AN OLD lathe-turned porch column makes a handsome lamp post at a fraction of the cost of a ready-made post. The columns can be bought at house-wrecking yards for very little and some are already hollow, making it easy to hide the wire. Any rotted parts at the top and bottom can be trimmed off since the post must be shortened anyway. I anchored mine in concrete with four angle irons at the corners, leaving a slight gap under the

post to keep out ants and moisture. The crossbar is a wood dowel through the post with ball-type drawer pulls at the ends. The pulls, which come threaded, can be attached by turning screws into the dowel, cutting off the heads, then screwing the pulls onto the screw shanks. The base of the lamp fits into a circular groove made by drilling a series of close-spaced holes in the post top.—*John Harvey Versteeg, Inkster, Mich.*



Lengthening Screens

AN ADJUSTABLE window screen can be lengthened to fit an extra-wide window by adding filler strips of $\frac{1}{8}$ " hardboard at the ends. Cut each strip of hardboard 1" wider than half the width of the gap to be filled, and glue and tack it into a $\frac{1}{8}$ "-by-1" rabbet made at each end of the window screen.—*Joe Hamaguchi, Steveston, B. C.*

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OUTDOOR LIVING
 in your own yard!



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Home Improvement Ideas

Revolving Screens Control Sun, Shade, and Breeze

THESE big patio screens of perforated hardboard can be swung in any direction to let in sun and breeze or block them out. The hardboard panels are framed at the top and bottom to hold them rigid and are bolted to pipe supports that turn freely in holes drilled in the concrete. The screens can be locked crosswise against strong winds

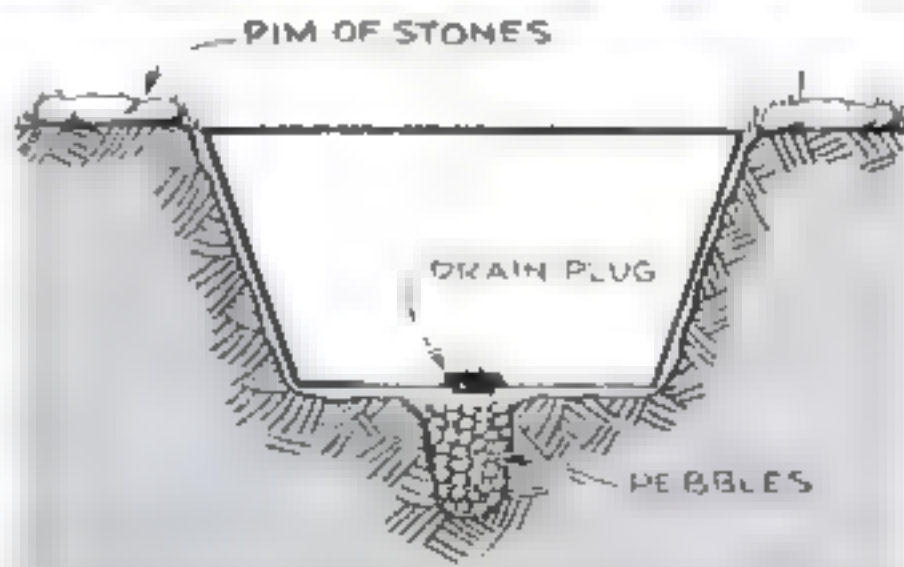


with hooks at the lower corners that latch into screw-eyes in the porch columns. Tempered hardboard was used.

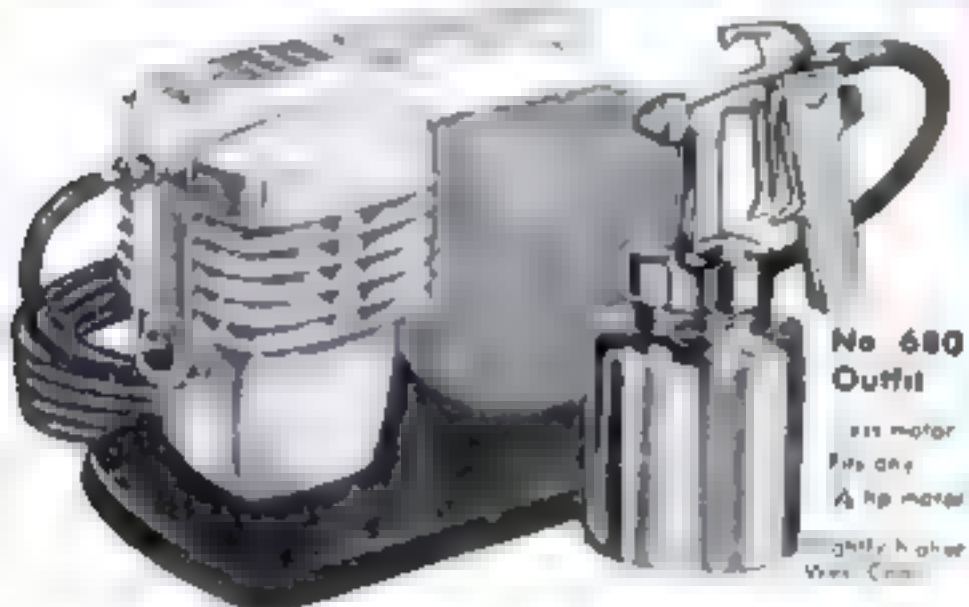


Garden Pool from a Washtub

THIS miniature garden pool is just a large laundry tub set in the ground. I first drilled a hole in the bottom and brazed on a large brass nut. A matching brass bolt with a crosspin through the head makes a handy drain plug. A small pit of pebbles under the tub serves as a drain field, and flat stones around the rim decorate the edge. The inside is painted an eye-catching aquamarine.—*F. W. Banner, Morrisville, Pa.*



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fits any
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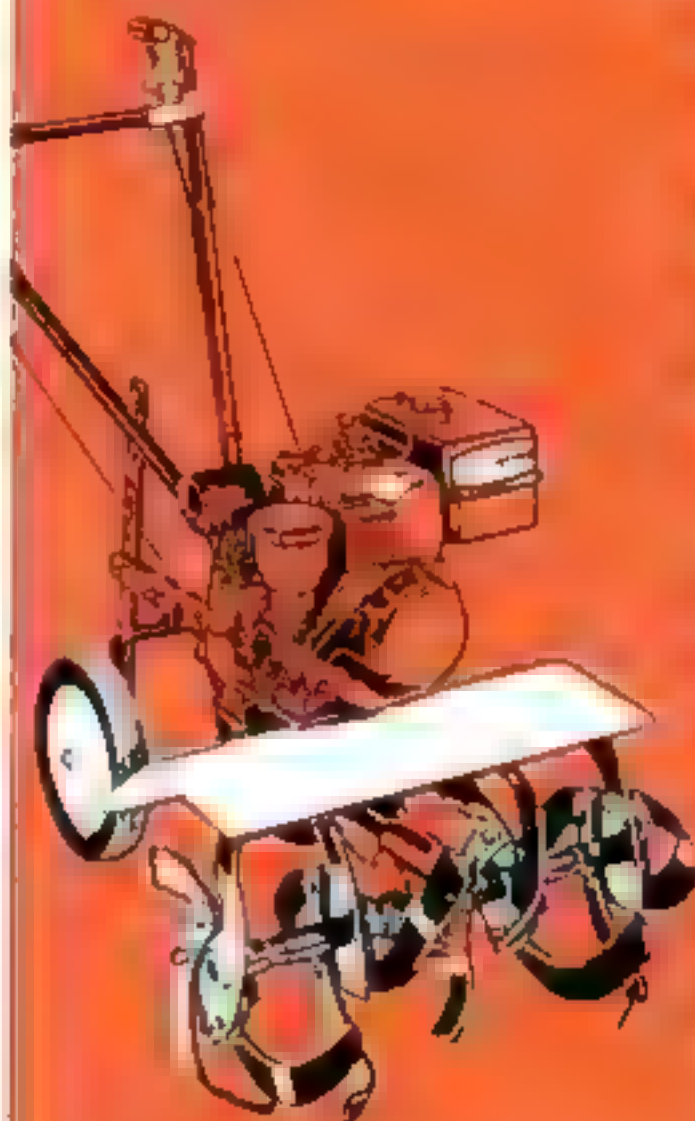
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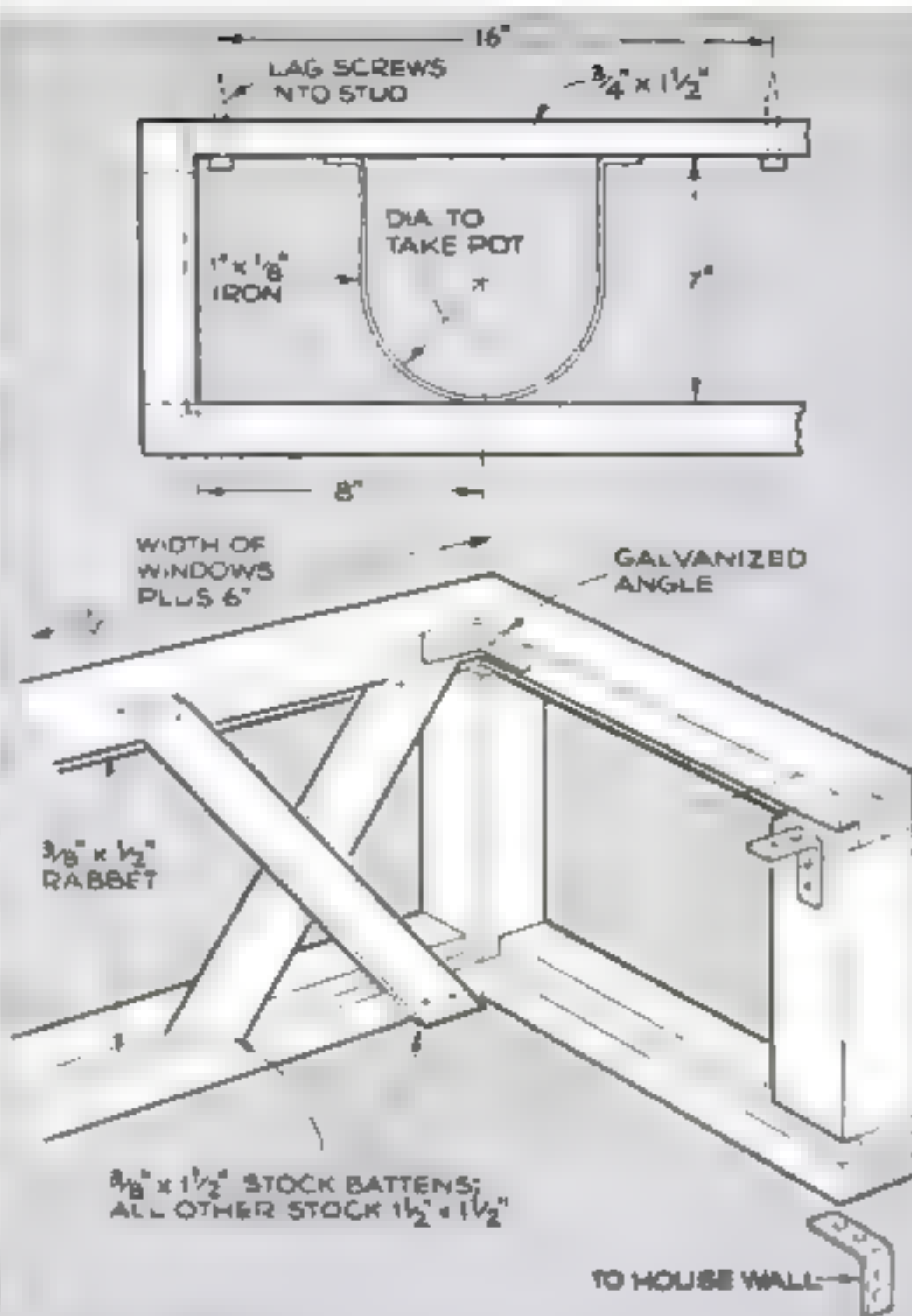
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Dressing Up a Home with Potted Plants



COLORFUL flowers outside a window brighten up a home. But you don't always need a window box. You can do the job with shelves and potted plants. That way you can use plants that are moved indoors for the winter.

Here are two good examples. The lattice-frame dimensions above can be adapted to the size and number of pots you want. Fasten the assembly 2" below the window sill. Paint to match the house siding or trim.

The shadow-box shelves shown at left are especially suited to a small single window. Assemble two-by-ten stock with simple butt joints and miter a strip of crown molding for the top trim.—*Hi Sibley, Nuevo, Calif.*

ARROW'S T-50 All-Purpose Heavy Duty STAPLE GUN

Grip the gun that gets the job done *faster, easier and better!* It's a breeze! One *squeeze* and it's nailed — with Arrow's *one-hand operated* T-50 Automatic Staple Gun! And you always have other hand *free* to position work or balance self! This rugged, all-steel, jam-proof professional tool is built for a long life of smooth, trouble-free operation!

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To the man who has the courage to be his own boss

Most everyone, at one time or another, has dreamed about being his own boss. But, this dream cannot become reality without courage, initiative, careful self-analysis, and proper attitude.

The Lindsay Company, world's largest manufacturer of home automatic water conditioning equipment, is looking for mature, self-starting men who are **really** interested in making a life-long career for themselves in the sales field.

Lindsay is rapidly expanding, and has a select few franchises available to the right men. A sales background is preferable, and

you must be able to organize and maintain an office and a staff of salesmen. You must want to work hard, but will also find this business one of the most financially rewarding in the U.S. today. If you have the personal qualifications and can make a modest investment, The Lindsay Company will help put you in a permanent, secure business. The right man will receive full factory assistance in establishing his dealership. If you are interested, and are able to make the necessary investment, send this coupon today to: Mr. Jim Lindsay, President, The Lindsay Company, Dept. 16, 1381 Marshall Ave., St. Paul 4, Minnesota.

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Yes, I am interested in starting a career in the water conditioning field. Please send me in confidence my copy of the Lindsay Opportunity Booklet.

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14



Tips for Fun Outdoors

Sidewalk shuffleboard brings neighborhood kids flocking to the home of T. L. Lane of Decatur, Ga. The concrete walk was painted light green before the court was laid out in white stripes. —Burk Uzzle, Atlanta, Ga.



▶▶▶ **A lawn badminton court** can be whisked away after the game, if you lay it out with cord. Anchor each corner with a loop slipped over the head of a large nail driven flush with the ground. Sink

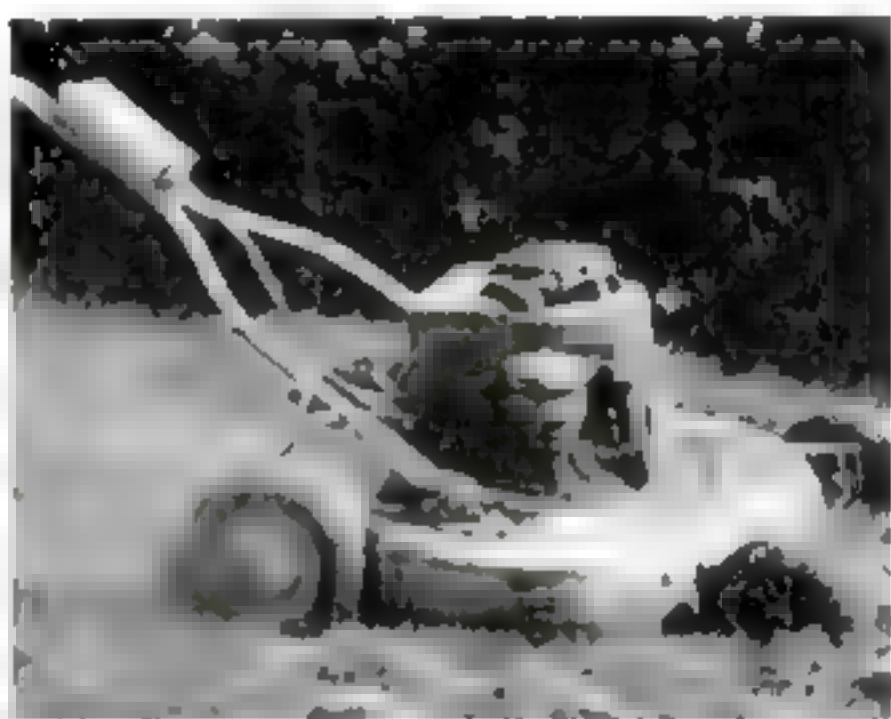
1' lengths of hard-copper tubing in the earth to serve as sockets for the net poles. After a garden party—or lawn mowing—the court can be set up again in minutes. —John G. Voelker, Timonium, Md.



Tires for toddlers. Cut-down casings make play equipment that's free of rough edges and splinters. For the swing (below), trim away about a third of an old



auto tire, leaving both beads intact. Turned inside out, it's a bucket seat small fry can't topple out of. For the sandbox, cut the bead and about 4" of the upper casing from a 12x38 tractor tire. —Orlin F. Frey, Polo, Ill.



Smoke out mosquitoes that lurk in shrubs to ruin outdoor fun. Solder one end of a copper tube in a hole punched in the bottom of a quart can. Fasten a petcock to the other end. Wire or strap the can to the power-mower handle and fill it with fuel oil mixed with four percent of chlordane. Open the petcock and let the solution drip in front of the exhaust, aiming the fumes into the foliage. —A. W. Ranniger, Carroll, Iowa.

Glue it right the first time with the right Weldwood Adhesive



Quick, clean Presto-Sol® Glue the all purpose glue bonds paper, wood, cloth, china. Dries fast, won't stain. Handy new ballows-action squeeze bottles with spreader tops. From 39¢.



Bonds instantly on contact. Weldwood Contact Cement permanently bonds plastic, leather and wood. Needs no clamping, and is water-resistant. Stays flexible. From 28¢.



Strongest of them all is Weldwood Plastic Resin Glue. For heavy-duty jobs. Makes joints even stronger than the wood itself. Mixes instantly, is water-resistant. From 40¢.



Waterproof and best for lawn furniture, boats, Weldwood Waterproof Resorcinol Glue makes a powerful bond on most porous materials. Resists rot, fungus, heat, cold. From \$1.15.

Put it together *permanently* with the Weldwood® Adhesive made for the job. Better still, keep all 4 Weldwood Adhesives handy—then you're always ready for almost any gluing job. Your hardware, lumber, and paint dealers stock them all—pick up a supply soon.



Products of United States Plywood

New French Import Is Saucy Performer

[Continued from page 81]

with the trunk densely packed with banknotes.

Cars, like men and animals, are designed by their environment. The 404 is neatly adapted to continental roads and traffic, for the most part not very different from U. S. metropolitan and suburban areas. In Paris, for instance, where traffic resembles a bullfight—especially around the great circles where fenders fountain in the air—the Peugeot can charge, swerve, and bluff with the best of them. Out on the straight two-lane country highways, where no speed limit at all restrains the Gallic exuberance, it can top 90 m.p.h., a velocity sufficient to blur the roadside poplars into a solid wall.

Light on its feet. In French villages and towns, where the road may abruptly neck down to nine feet, and where a sharp bend can suddenly unfold such surprises as a hog, a truck, a platoon of intrepid bicyclists, or a sharp-tongued matron, it foots its way sinuously. Steering, though light, has an alert 18.6:1 ratio, and the turning circle is a pleasing 31.6 feet. When this agility is combined with excellent ride and handling, comparable to the best of the 1961 U. S. compacts, you have the kind of car in which you sing as you drive along.

Not that the 404 doesn't make demands on you, too. The first comes as you get in. If you are near six feet in height, it politely but firmly knocks your hat off. A second idiosyncrasy shows up only after driving 400 kilometers or so, when it becomes evident that the French accelerator foot and knee evidently bend in slightly different planes than do ours. And a third oddity, also a minor one, is that while you may indeed sing as you drive along, the transmission and differential will often sing softly back.

Introduced in France last spring but just now arriving in the U. S., the Peugeot 404 is an extremely Gallic vehicle; if it had shoulders it would shrug them. The national temperament is reflected not only in chic style and close attention to detail—it is a car from which nothing falls off, or comes off in your hands—but also in an intense practicality. Under the hood, for example, a hand crank is cleated conveniently, it being known in France that batteries do, in time, expire,

usually at moments of maximum inconvenience.

The practicality extends to the shift pattern, which starts out to be identical with the standard U. S. three-speed column shift. Which means that it poses no unfamiliar terrors for the U. S. lady buyer, at least until she graduates to the need for fourth or top gear. This speed turns out to lie next to, and beneath, second, and is achieved by a peculiar, melon-scooping movement of the lever.

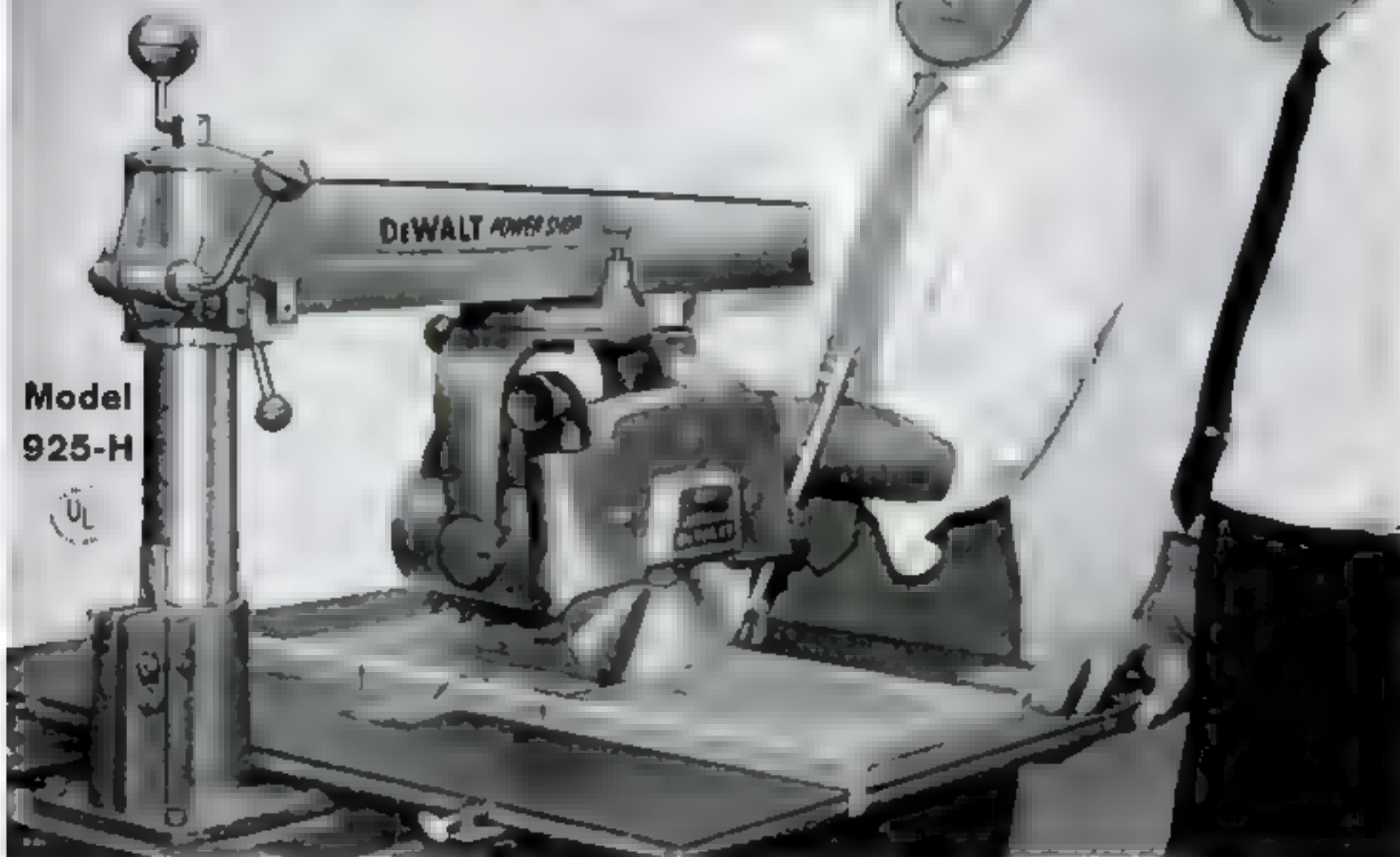
A smooth little four. This same mixture of practicality and sophistication can be found under the hood. The 404 is conducted by an artful little OHV four of only about 99 cubic inches—barely 70 percent the size of that in our smallest domestic compact, the Corvair, and less than half the displacement of several other U. S. compacts. It has hemispherical combustion chambers, oversquare proportions, and uncommon smoothness for a four. It runs, in fact, from an easy tick-over at idle up to and beyond 5,400 revs, managing it with the blandness of a sewing machine stitching silk.

Using a cast-iron block with removable wet sleeves, the engine is canted over 45 degrees to the right, to lower the center of gravity and the hood line. One interesting feature is a magnetic clutch in the fan drive; whenever the coolant is below 180 degrees, the fan idles, to save power, reduce noise, and speed warm-up. With this able little engine mated to a car with a curb weight pared down close to 2,200 pounds, you get fair performance from very modest fuel consumption. Zero-to-60 acceleration takes about 19 seconds. This is hardly blinding but is still substantially brisker than that of many imports on U.S. highways.

The \$2,575 price of the Peugeot 404—which includes, by the way, such comforts as heater, sliding sun roof, and reclining front seats—puts it up against the middle rank of Detroit compacts, which is rough competition in any league. As compared with its Detroit opposite numbers, you get slightly less room and acceleration. To compensate, you get markedly superior fuel mileage, greater agility, and an impressive number of practical conveniences.

It'd be a hard choice.—*Frank Rowsome.*

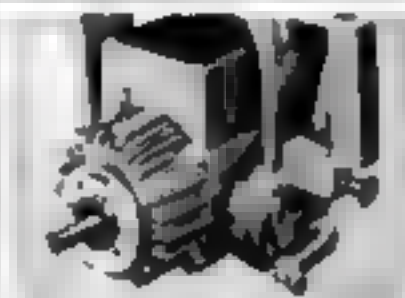
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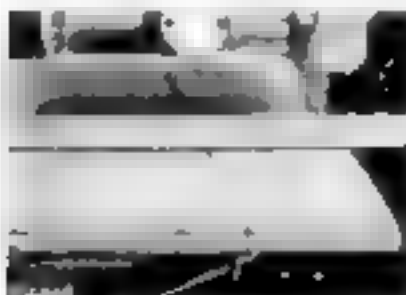
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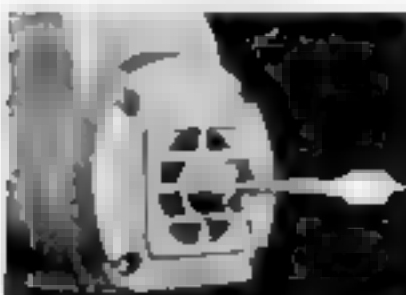
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SEE Extra safety in
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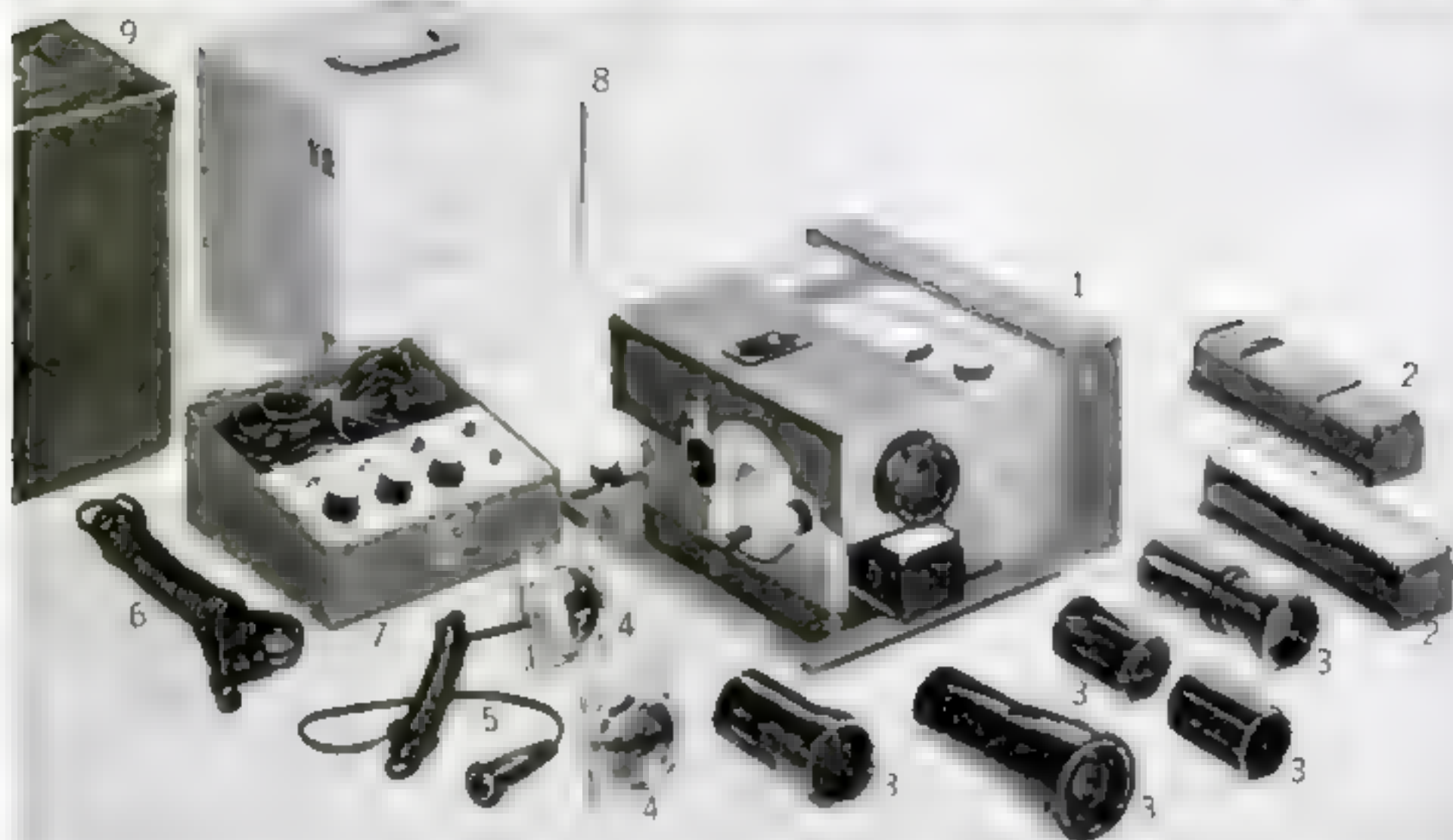
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New Ideas in Photography



1. Kodak Cavalcade Projector, Model 510. With 5-inch $f/2.8$ lens, less than \$140. Model 520, with 5-inch $f/3.5$ lens, less than \$110.

2. Two types of trays hold all 2 x 2 mounts.

3. Five lenses let you fit picture on big and small screens, at long and short projection throws. Sizes are 8", 4", 5", 7" and zoom ($3\frac{3}{4}"$ to $6\frac{1}{4}"$).

4. Two condensers: universal, for all 2 x 2 slide sizes; hi-efficiency condenser for extra brilliance with 35mm and No. 828 slides.

5. Remote control cord, 12 feet long.

6. Extension for remote control cord adds 25 feet. Use any number.

7. Programmer lets you add synchronized voice commentary and music to all your color-slide shows. Any popular tape recorder may be used. Makes every show "come alive."

8. Carrying case for slide trays.

9. Protective cover for projector case.

"Cavalcade" system lets you advance from showing slides to showmanship

Now you can custom-build an automatic slide-showing system that exactly fits your needs. Just start with a Kodak Cavalcade Projector (*shown above*) and add components when you need them.

Cavalcade Projectors not only change slides automatically—they also let you reverse, repeat, skip, or hold a slide on screen. Don't need constant focusing because slides are pre-conditioned by warm air. You can edit slides instantly. And the system of aids

gives Cavalcade Projectors unique versatility. Let your dealer show you.

New Camera Simplifies Flash Shots

Flash exposures are set automatically by new Kodak Motormatic 35 Camera. When subject is 5 to 25 feet away, setting the focus also sets lens opening. Film-winding is automatic, too. A tiny motor automatically advances film, cocks shutter, after each shot. Less than \$110.

from Kodak

New wonder metal brings rich sound to your 8mm movies

Precision engineering and a new "wonder metal" have now brought top-quality do-it-yourself sound to 8mm home movies.

New Kodak equipment lets you convert your 8mm films to sound movies—with wide-range music and your family's true-to-life voices. All it takes is a magnetic stripe on the film and a Kodak Sound 8 Projector in your living room.

You need precision magnetic striping, such as Kodak Sonotrack Coating, and a precision projector—because the magnetic stripe on 8mm film is only 3/1000 inch wide!

The sound-pickup head is so small that ordinary magnetic materials wear out quickly. Kodak engineers achieved an almost wear-proof head by choosing Alfenol—a new, incredibly hard magnetic alloy. It gives hundreds of hours of use!

And the engineers found a way to keep the 2/1000-inch-wide head dead-centered on the 3/1000-inch track. There's no "edge tracking" to distort sound.

How the system works. Ask your dealer to have Kodak Sonotrack Coating put on your 8mm films. Then project the film with a Kodak Sound 8 Projector. Talk through the mike. Add music, sound effects, by connecting your record player or tape recorder to the projector.

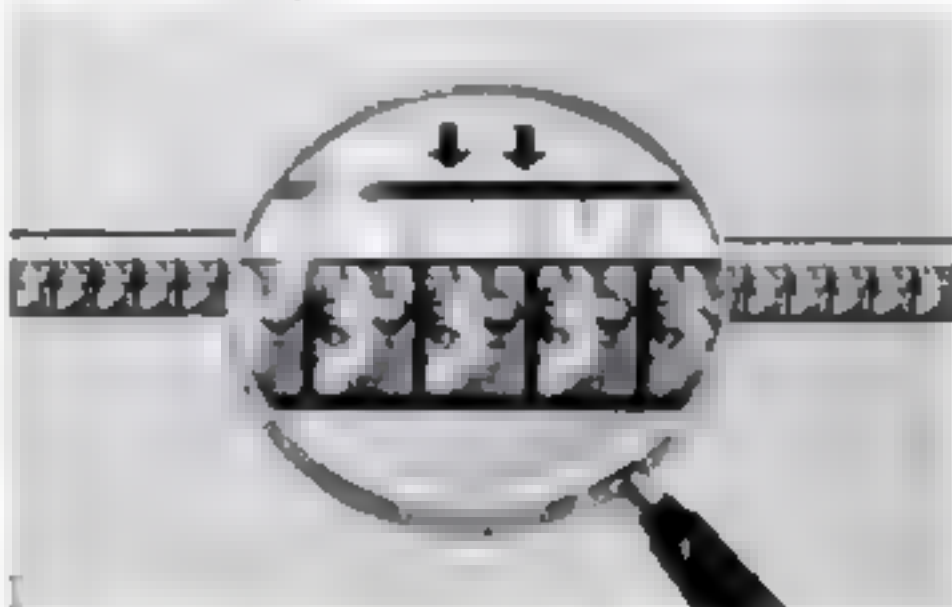
After recording, play your new sound movie back instantly. If you want to make changes, just erase and re-record! You play back through the projector's own high-quality balanced amplifier system. Or you may hook in your home hi-fi system.

Movies are brilliant and sharp, up to five feet wide. Choice of two forward speeds (16 and 24 fps), still and reverse.

Kodak Sound 8 Projector, with mike and phono connector cord, is less than \$350. See your dealer for exact retail prices.



INCREDIBLY HARD magnetic head made of Alfenol will record for countless hours without any loss in the sound quality.



TO ADD SOUND to your 8mm films, take processed film to dealer and have Kodak Sonotrack Coating applied to edge. Costs but a few cents a foot.



VOICES, MUSIC, SOUND EFFECTS add realism, professional touch. Children's voices, recorded at different ages, dramatize growth shown in movies.

Prices are subject to change without notice

Many dealers offer terms as low as 10% down.

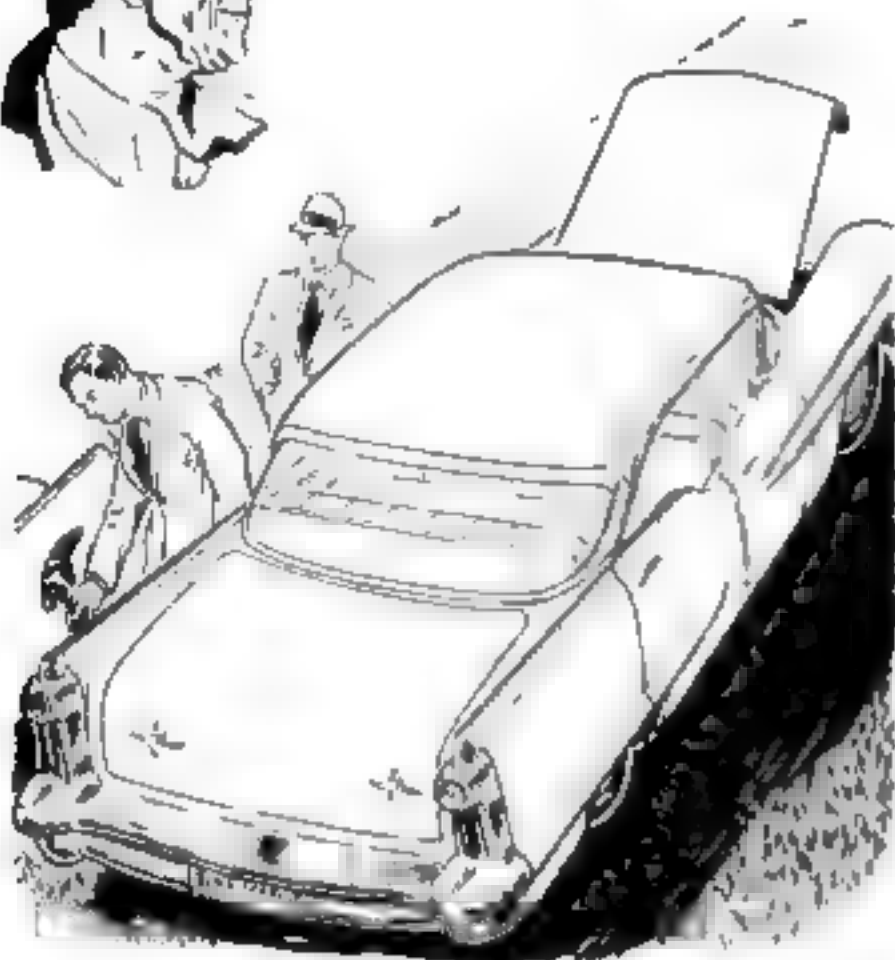
EASTMAN KODAK COMPANY, Rochester 4, N.Y.

See Kodak's "The Ed Sullivan Show" and "The Adventures of Ozzie and Harriet"

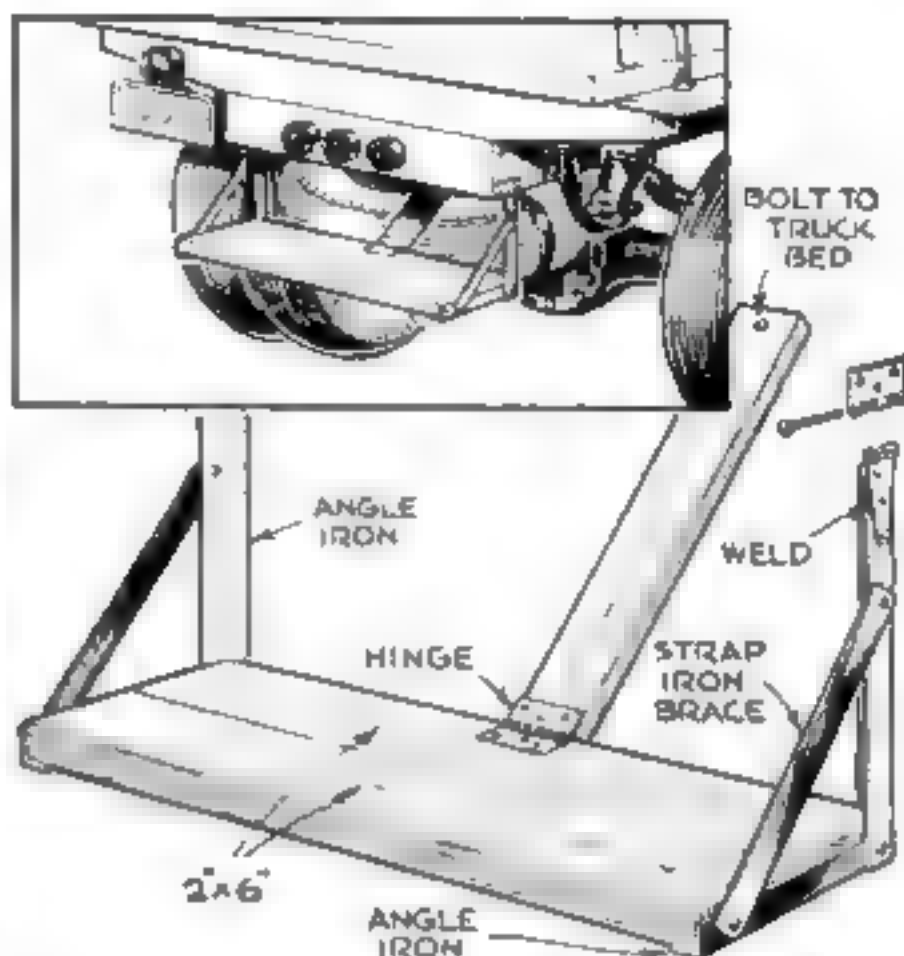
KODAK
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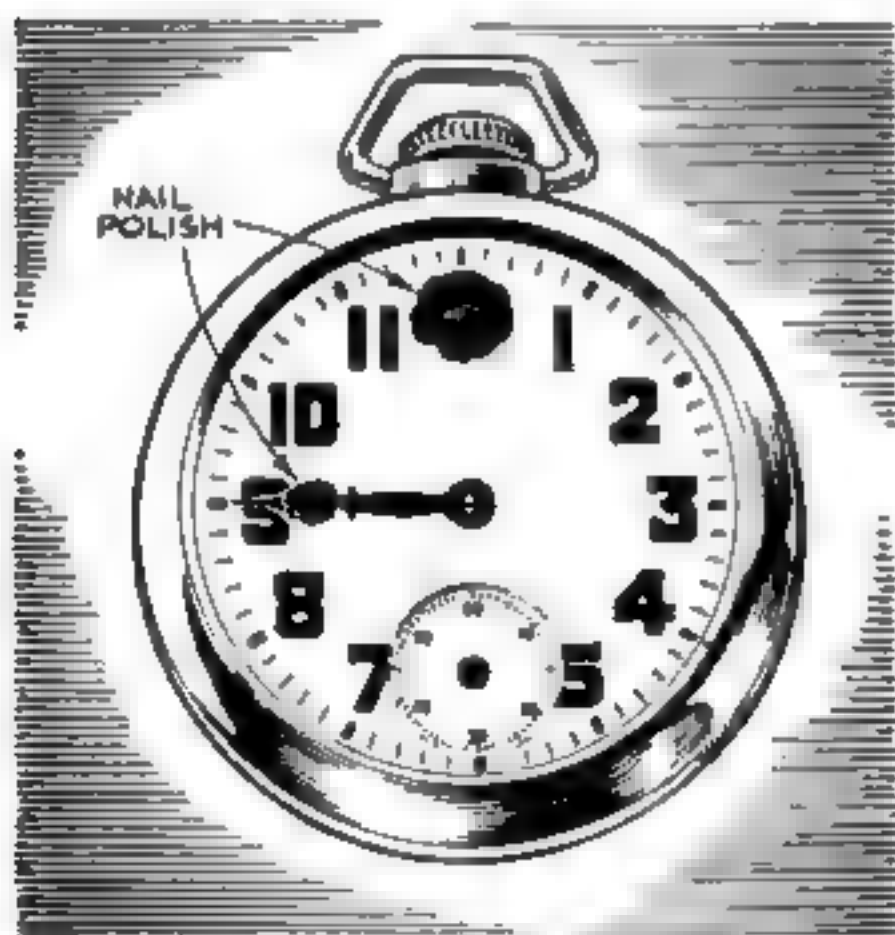
Hints from the Model Garage



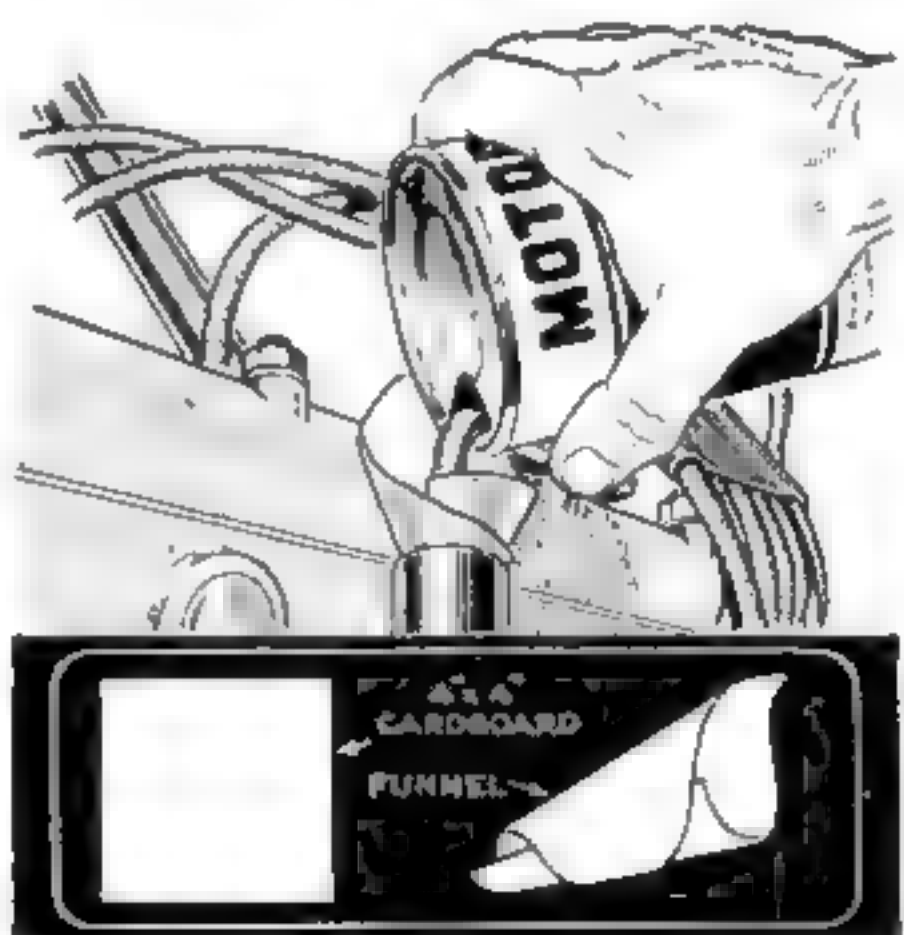
Running out of gas is bad enough, but to be unable to get it when someone offers help is worse. A good thing to remember: A tire-pump hose or windshield-wiper hose makes a fine siphon tube for drawing gas from a Good Samaritan's tank.



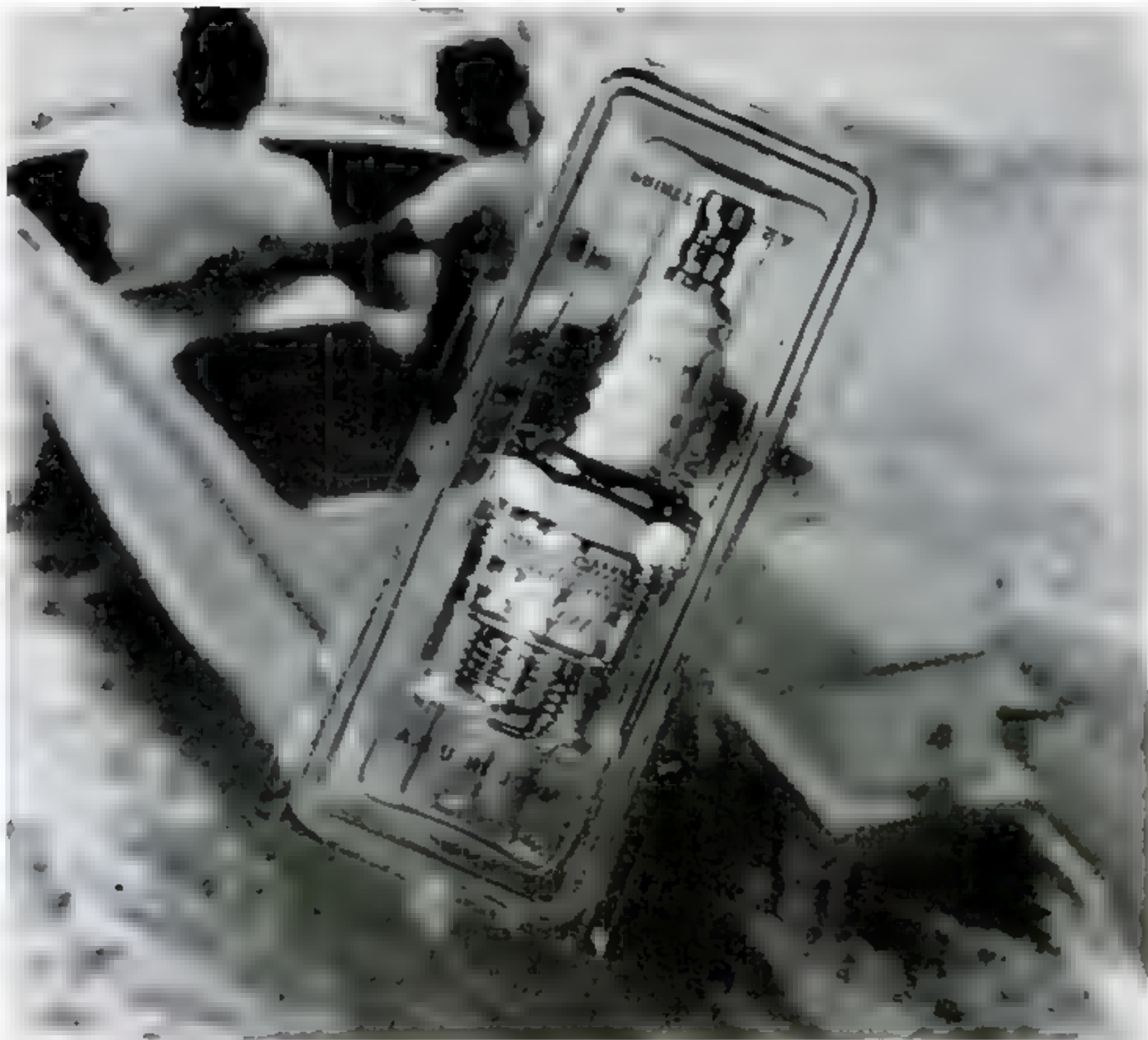
A rear step on a truck is sometimes useful, sometimes not wanted, depending on the work being done. A removable step solves the problem. Fasten it in place with hinges, using heavy cotter pins instead of hinge pins to join them.



To avoid parking tickets, convert an old watch into a parking-meter timer by removing all but the minute hand and painting on red dots. Set it backwards for the time you paid for (15 minutes shown above) and check it as you shop.



The funnel is always clean when you roll your own from a 4"-by-4" square of cardboard, manila envelope, or aluminum foil. Throw it away after using it to pour oil or fluid into the engine or transmission, and roll a fresh one next time.



Start the season with *this* spark plug— especially designed for boating by Champion!

Loaded with outstanding and exclusive features, this great marine Champion is performance-proved! It gets the best out of every outboard—including yours . . .

This great marine spark plug is especially designed for boating by Champion—the spark plug specialist! It's the kind of spark plug you need for top performance in your marine engine. (These marine Champions sparked every class winner in

both the 1960 National Stock Outboard meet and the APBA Outboard Championships!)

In waterproof packs that make them ideal as spares, too, these Champions have rust-resistant plating, attached gaskets for easier installation, and Powerfire

marine electrodes for longer plug life. Get the new boating season off to a sparking good start with a new set of the spark plugs especially designed for boating—*marine Champions!*

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More Hints from the Model Garage



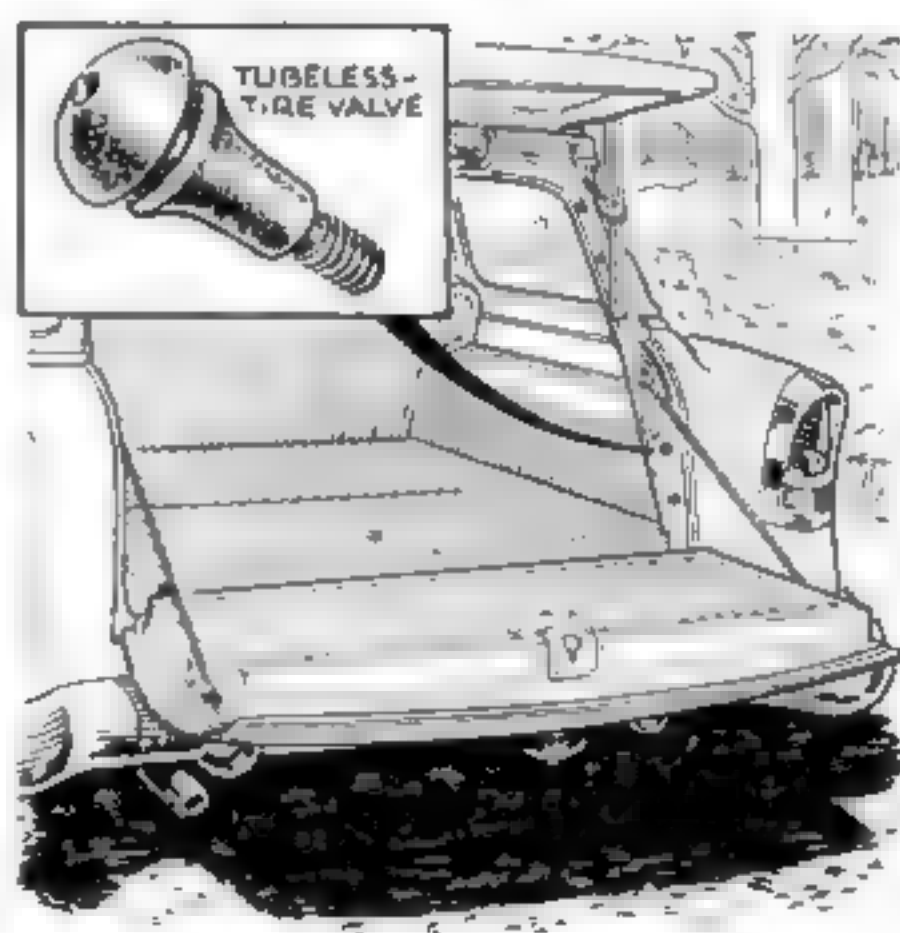
The dome light can be used by passengers in the rear seat, without reducing the driver's visibility, if a shield is placed in front of the light. Loosen the holding screws, slip folded cardboard under the frame, and tighten the screws.



You can gain extra room at the rear of your garage, or shelter almost half of a second car, by extending the garage length with an overhang. Create it by fastening a panel of exterior plywood permanently across the swing-out doors.



For a neater trunk, fit the spare wheel with a hubcap or wheel disk. This provides concealed storage space for work gloves, hand cleaner, and a rag—items that you'll find useful if you have to change a tire or make a roadside repair.



There's a use for everything—even old tubeless-tire valve stems. Drill holes in the tailgate frame of a station wagon and press the stems into them. The rounded bottom ends cushion metal-to-metal contact, effectively silencing rattles.

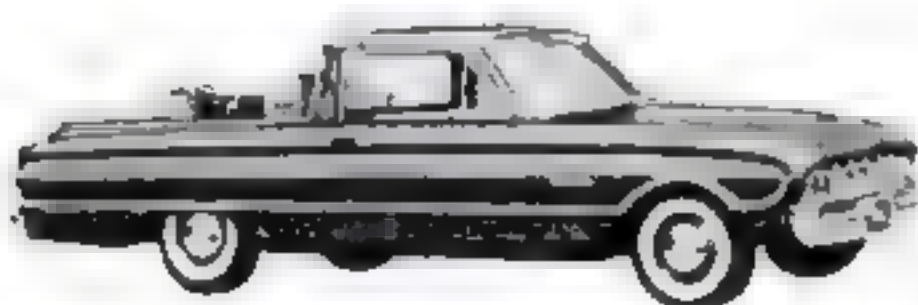
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FORD TRUCKS COST LESS



Gus Repairs a Friendship

By Martin Bunn

SWINGING into the busiest intersection in town, the owner of the Model Garage braked to a stop behind a 15-car pile-up. Soon the flow in the opposite lane halted and Gus Wilson's lane of cars began a detour. But not Gus; the patrolman waved him to a stop behind the car causing the bottleneck.

"See if you can help him, Gus," the officer said. "He keeps starting his engine but can't seem to move."

Gus walked to the stalled car, a vaguely familiar V-8 of popular make.

Jim Hollister, red-faced, turned harassed eyes on him. "Gus! Can you bail me out of this mess?"

"Try the engine when I signal."

All seemed normal under the hood, and Gus waved. The engine roared spirit-

edly. Grasping the throttle rod near the carburetor, Gus gunned it several times. It took gas well. He lowered the hood. Apparently afraid it would stall, Hollister raced the engine in short bursts.

"I'll be in tomorrow," he yelled. "Had all I can take from this crate!"

Gus nodded, turned back to his car, and suddenly remembered why the sedan seemed familiar. It wasn't Hollister's, but Alf Brandon's.

Next morning, it was Brandon who awaited Gus at the Model Garage. The slim, red-headed insurance agent seemed embarrassed.

"Something about my policy, Alf?"

"Wish it were, Gus. No, it's Jim Hollister—or rather, his car."

"Wasn't he head of your local office, before you took over?" asked Gus.

Brandon nodded glumly. "He's still

"You won't have to
get him to bring
the car in," said
Gus, looking out
of the office.
"He's here."



my boss, only more so. That makes it tougher. I sold him that car seven weeks ago, when he moved to the city as supervisor. His wife drives his other one."

"He's not blaming you for his car trouble, is he?" asked Gus. "After all this time?"

"That's just it!" groaned Brandon. "It began right after he left. At the worst times in traffic or on hills, the engine gives out. Hollister thinks I deliberately unloaded a lemon on him."

"But you and he were friends!"

"*Were* is the word," muttered Brandon. "He's sent me some nasty letters. Now he's making trouble about my accounts—drove up last night to investigate my office. I've offered to buy the car back, but he only snarls at me."

"I serviced that car," mused Gus. "Don't recall any such trouble."

"There wasn't any. Gus, I'm going to ask him to bring the car to you so you can check it."

"Won't have to," remarked Gus, looking out of the office. "He's here."

"**I**T HAPPENED twice on the way over," roared Hollister as he got out of the car.

"Just what does happen?" asked Gus.

"Ask him!" bellowed Hollister, with a savage head jerk in Brandon's direction. "He knows—he got rid of it!"

"Almost two months ago," Gus pointed out. "A lot can happen to a car in that time. Tell me how it acts."

"It stalls!" snarled the big man. "It quits. You tromp on the gas and it only squats. I've been hung up in traffic, had my ears chewed by cops, had to roll back against the curb on hills."

"What's been done?" asked Gus.

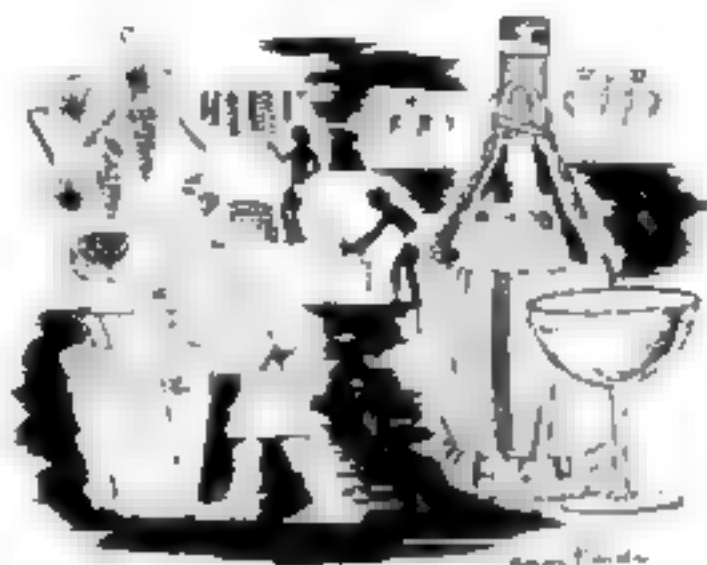
"Plenty! The agency said the timing was too far advanced and set it back. That didn't help. When I went back, they found the points burned, put in new ones. Still no go. Next it was a fuel pump, then high-voltage wiring. Nothing helped."

"I'll check it," promised Gus.

Brandon stepped forward. "Jim—can I drive you to the office?"

Ignoring him, Hollister stamped out.

Where'd it come from?



WINE was known in Egypt and Mesopotamia before 3000 B.C. Both civilizations used similar processes of pressing, fermentation (through the wild yeasts present in grape-skins), filling, and storage.

Often given poetic labels such as "the divine liquid" and "the unguent of the heart," wine was first restricted to ritual and religious use, later consumed by the wealthy classes. The Greeks introduced wine drinking on a wide scale to all classes.

A ROAD call had forced Gus to turn the car over to Stan Hicks, his assistant. On his way back he was flagged by another distressed motorist. It was after two when he returned to the shop.

"Did you get to test-drive Hollister's car?" he asked Stan.

"Sure, Gus, and it quit like he said. Looked like the fuel pump to me, but the oscilloscope tester paid off."

"What did it turn up?"

"A bum coil. I put in a new one, left it for you to check out."

As Gus looked at the clock, figuring on lunch, a glowering Hollister walked in.

"Find the trouble?" he asked.

"Found a weak coil," said Gus. "But it may not be that. Let's try it."

Gus drove the car out and headed away from town. The engine was quiet and responsive, the automatic drive faultless. Hollister thawed slightly.

"Seems you licked it. Bum coil, hey? Could that go bad in just a few weeks?"

"It could," answered Gus, halting at a stop street. "I'll say this, Jim—I don't think Alf ever had that trouble."

"Hmmp! Maybe not."

With the lever still in Drive, Gus nudged down the throttle. Nothing happened. Watching closely, Hollister exploded.

"New coil! There's a lot worse wrong

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with this bus. I'll bet the transmission needs a big job done on it—and Brandon knew it. That's why he dumped it—"

Trying to restart the engine, Gus didn't answer. The starter refused to engage, and the angry man's outburst drowned out something Gus sensed rather than heard. Again he tried the throttle. The engine bellowed in response.

With an idea dawning, Gus made numerous stops and starts—until once more the engine failed to answer. Deaf to the big man's grumbling, Gus did nothing but use his eyes.

They told him that the oil-pressure and generator warning lights hadn't lit, as they should have if the engine had

is hooked to this second link, on the same pivot but connected to the first one only by a spring. As you step down, the spring pulls the second link, opening the throttle."

"Why all that?" asked Hollister.

"Your kickdown, when you want extra power or pickup, is by a mechanical link from the pedal to the transmission. But sometimes you want full throttle without downshifting. Then the pedal has to give it without working the kickdown. For that extra push when you do want it, the pedal has to travel a bit farther, with the throttle already wide. Then the spring stretches to allow it."

"So what's wrong?" asked Stan.

"The spring. Maybe it wasn't tempered right, or somebody working on the car caught and stretched it. It's weak, doesn't pull the second link reliably."

"Then why does it usually work?" asked Hollister skeptically.

"Sometimes gummed dirt between links acts as a drag, helping out the spring," explained Gus. "When you're in a hurry or excited, and jam the pedal down, the dirt breaks free, the spring stretches, and the throttle stays at idle."

"That doesn't prove Alf didn't have the same grief,"

said Hollister.

"No, but I can," returned Gus. "He had his car serviced here for two years before you got it. I can show you his bills—and not one's for any complaint like this one. We'll clean the linkage and put in the right spring and your car will purr like a kitten."

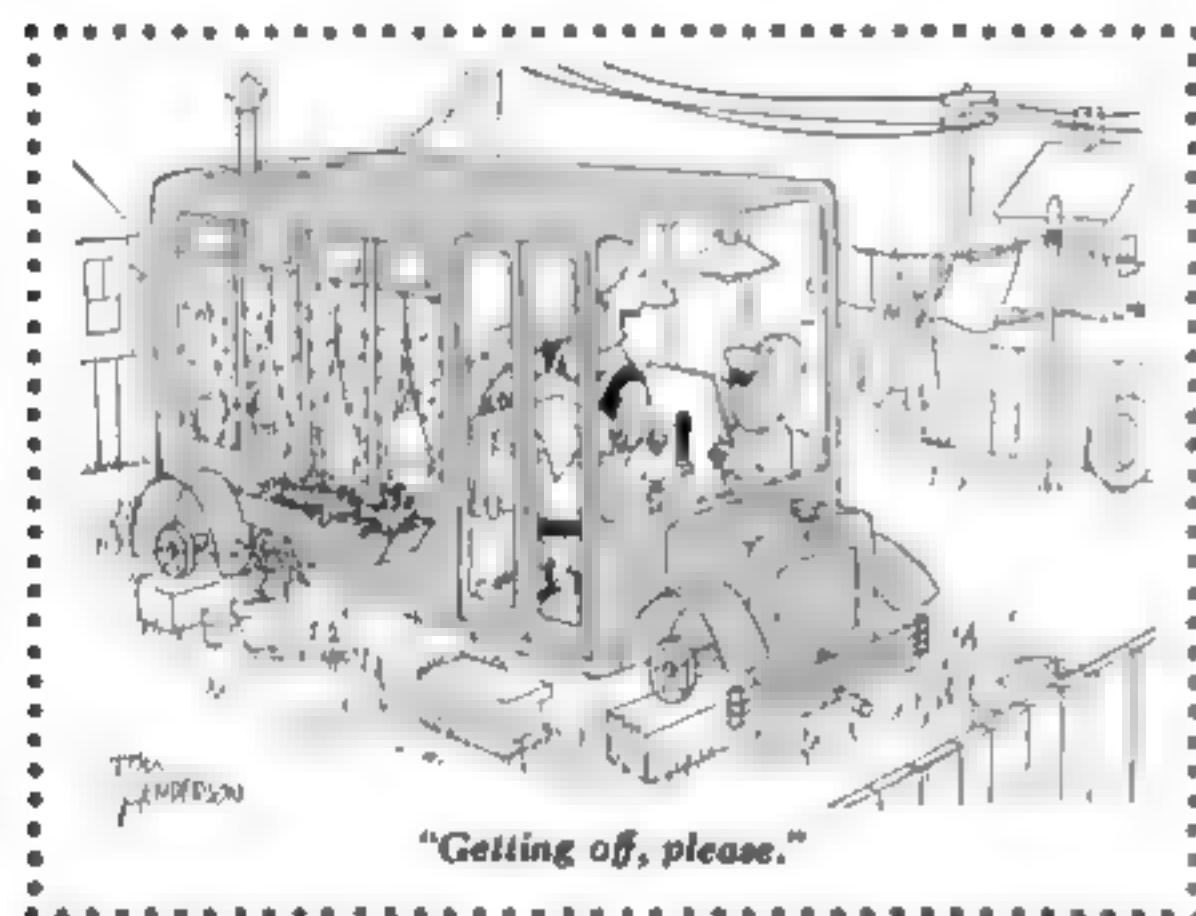
Hollister clapped him on the shoulder. "Go ahead, Gus. I've got a job of my own to do."

He walked out, setting his hat firmly. Gus grinned at Stan.

"Hear that, Stan? Better get that new spring in fast. What he has to do won't take long."

"What d'you mean, Gus?"

"He's going to patch up a friendship—and there'll be two of them working at that job."



stalled. Now, senses alert, Gus felt the faint vibration of a well-balanced engine just ticking over. He tapped the throttle again and again—until, suddenly, the engine roared.

"It's going to be okay," said Gus.

STAN ran up as they drove in.

"That coil was bad, Stan," called Gus, "but it never stalled the engine."

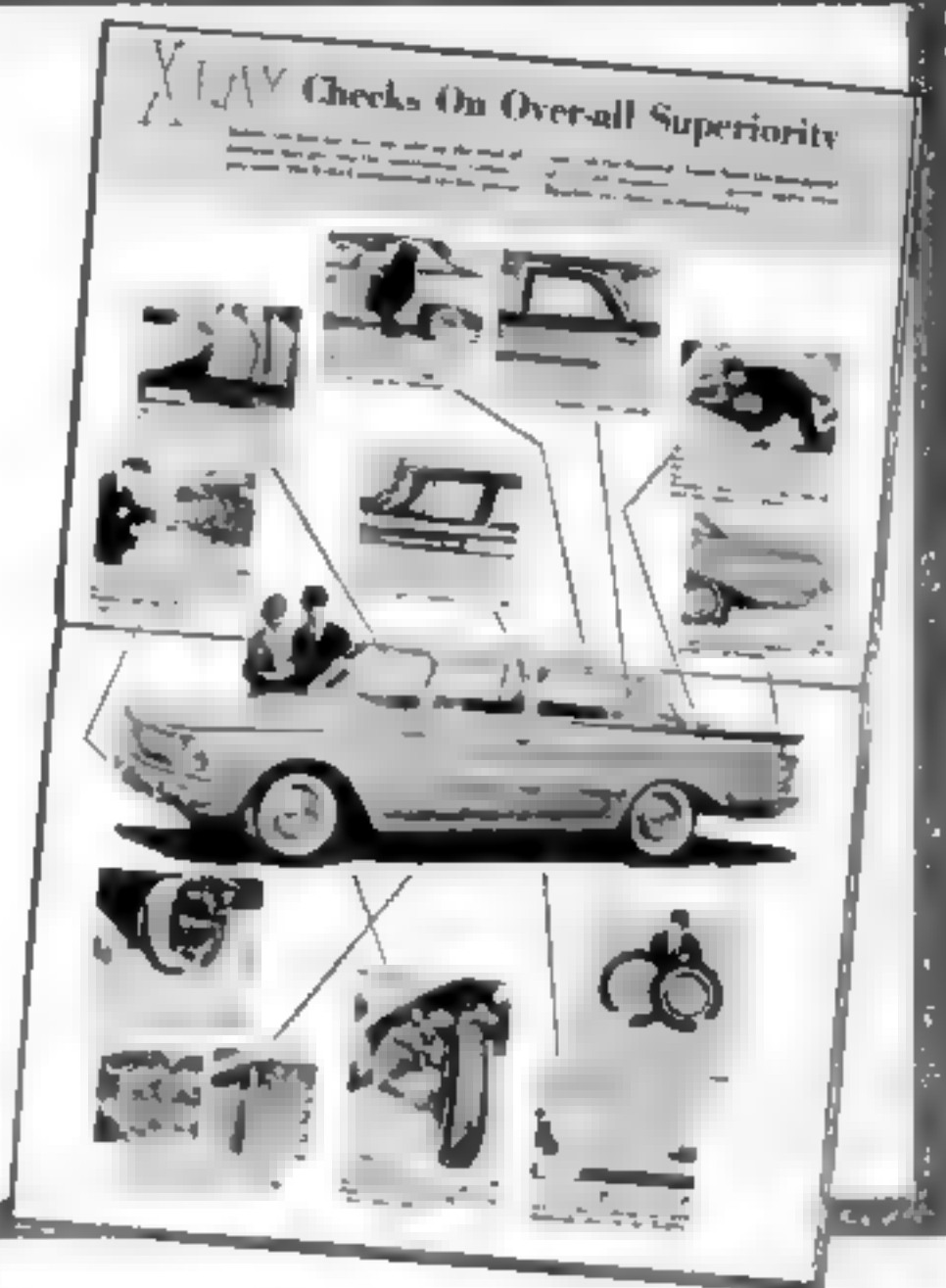
"Something did!" snapped Hollister.

"Nope," repeated Gus, lifting the hood. "It never did stall. You thought it did, because the car wouldn't move."

He lifted off the doughnut-shaped air cleaner, pointed to throttle linkage some inches from the carburetor.

"On automatic-drive cars of this make," Gus explained, "the pedal swings this pivoted link. The carburetor throttle

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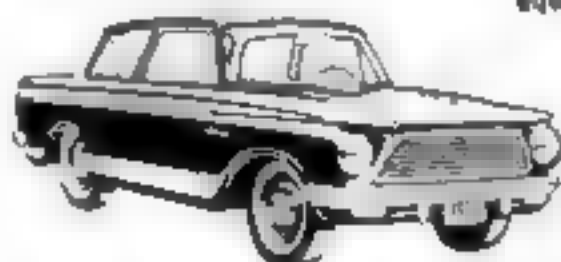
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New Attachment Converts Your 35-MM. Camera to Stereo

[Continued from page 126]

sion frame bridges the revolving lens mount so you won't have to adjust the cowl each time you focus. The frame forks under the C-3's idler cap and plugs into the flash sockets.

Single-lens (beam-splitting) stereo converters have been available for some time, but have always suffered from three serious drawbacks:

- Since the twin images are projected onto the film side by side, only tall, thin pictures are possible—a shape that often makes for awkward composition in scenic shots and group portraits.

- The all-mirror reflection system results in considerable light loss, requiring doubled exposure time or larger aperture.

- Tilted mirrors bounce the twin images through the lens so that they strike the film plane at different angles, resulting in peripheral discrepancies in magnification that prevent proper register when the two images are superimposed.

A simple misconception has been responsible for that hard-on-the-eyes effect in the off-center areas of such stereo pictures. Designers of side-by-side-image converters have reasoned that since your eyes converge to focus on an object, tilted mirrors will simulate this effect. What they overlook is that your retina is curved to avoid the distortion caused by slightly angled images, while film is flat and records a "keystone" distortion—a false perspective that runs in opposite directions in the two images.

Head-to-head stereo. In the new system, the optical axis of the lens corresponds to the same point of the scene in both images. The prism splits the lens and delivers the images at equal angles to the film surface. The result: stereo comparable in quality to that produced by expensive twin-lens cameras.

Such stereo cameras, of course, take two full-frame pictures that must be mounted in a double-window slide. The new prism converter, by compressing the images into a single frame, saves you money on film and mounting. You get up to 40 percent more shots per roll and needn't give special instructions to the processor. The converter is easy to put on and take off the camera, so that you use it only when the subject warrants a 3-D

effect (where the principal subject is less than 10 feet from the lens). The stereo shots scattered along the film strip will come back in two-by-two-inch mounts, like your conventional slides.

For home processing, the system is ideal; even a darkroom Fumblefingers can't scramble stereo pairs that are permanently fused within a single frame.

One big difference between regular and stereo slides is in the viewing. A pocket-sized hand viewer (with a clever skylight to trap illumination) comes with the converter. You just insert each new stereo slide, adjust for the 3-D effect, pierce the mount with a positioning needle, and use this pinhole as a guide for punching a permanent adjustment slot. Thereafter, the slide positions itself automatically.

(Just perfected, and about to go into manufacture, is an attachment that uses the camera converter to project pictures, up to three feet wide, on a screen. This device will fit on current-model automatic slide projectors and will be the first stereo setup to provide automatic projection—without those eye-torturing intervals of manual adjustment. Viewers will wear polaroid glasses.)

Taking the picture. Aperture and shutter settings will be the same as for a standard shot. The converter doesn't interfere with the use of your camera's range finder for focusing. (Even single-lens reflex cameras with ground glass are focused as usual, though the split-field range finder can't be used.)

Then comes the oddity: You point the lens skyward, compose your shot through the viewfinder in the center of the cowl, and press the shutter release. Except with the C-3 (where the plug-in frame provides new flash sockets properly angled to position the gun for tipped-up shooting), you'll have to rearrange your flash attachment—unless you want the light bounced off the ceiling.

The complete set includes converter, viewer, hand punch, and instruction manual. What makes it particularly attractive is the price. Postpaid from the manufacturer, Tri-Delta Engineering, Box 53, Fairlawn, N.J., the set is \$28.75. This is standard for both the screw-in and plug-in types, but step-up rings are extra.—*Alfred Wm. Lees.*

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Could False Alarm Trigger Atomic War?

[Continued from page 65]

the ground (where they are sitting ducks for missile attack) and on their way. But the bombers will turn and fly home, H-weapons still in their bays, unless they get a second order to continue to target. The second order has to come from the President of the United States.

That's not all. None of these men bets all his chips on electronic warnings. Intelligence reports count more.

The Norad intelligence boss is Brig. Gen. Harris B. Hull, a soft-voiced man who collects PhDs as assistants and who conceals his own steel-trap brain behind a gentle, almost ingenuous appearance. He explained to me:

"We watch 10 to 20 indicators. It's not all secret-agent stuff. There are a lot of obvious things, like the locations of Soviet ships, shipments of fuel and supplies, political disputes in small nations, or just where world leaders are. The Russians are not likely to start World War III while they're entertaining Nehru in Moscow."

These days, a few of the indicators are usually flashing red, or at least yellow. All of them flashing red would cause real concern. That plus alarm signals from the radar would call for action. But even then the action might not be full-scale retaliation.

Can accidents happen? The third backstop against false-alarm war is the nature of modern war itself. A surprise attack is certain to be blitzkrieg—huge masses of manned bombers and missiles swarming in from every direction at once. You couldn't mistake it.

So one or a few hostile missiles would not start a war. The brutal fact is this: If we spotted just a few missiles, even if we watched them strike and destroy one or two of our cities, we might take the loss and hold our fire. It could be an accident. Appalling as such an accident would be, all-out war is worse.

The October 5 incident that worried those distinguished visitors was a false alarm, the first involving missiles. Here is what happened:

At 3:17 p. m. the direct-line phone from BMEWS jangled. Stocky, crew-cut Maj. Glenn Perryman picked it up. From Greenland, William Leonard, the civilian (RCA) engineer on duty, reported: "We

have something. The raid estimate [number of missiles] is one . . . now it's four. The alarm level is five."

Perryman punched the buttons at his elbow to put those numbers on the board. The alarm raced up through channels, to Canadian Group Capt. Ed Hale, to operations chief Brig. Gen. Milton Ogden, then to the Battle Staff.

That day General Kuter was in an airplane, flying back from a meeting. In command was Air Marshal Slemon.

Slemon is a tough, neatly mustached veteran of Arctic flying who wouldn't let a deluge of bombs ruffle his smooth brown hair. (He later chastised some officers for speaking too loudly and generating an air of excitement.)

"I was convinced from the beginning that it was a false alarm," he recalls. "BMEWS had first gone into operation only five days before. It was still in the debugging stage. Something like this was to be expected."

The yellow phone. Yet this cool estimate didn't mean that Norad sat on its hands. In minutes, Slemon and his staff were at the phone-loaded counter overlooking the screens and display boards. Instantly he was on the yellow phone, telling the Joint Chiefs of Staff in Washington, "We have a little flurry here." (He also called SAC, and radioed General Kuter in flight.) Almost as quickly, the alarm began to fade—although the raid estimate jumped to 99 missiles.

"The first thing I asked Intelligence," says Slemon, "was 'Is Khrushchev still in New York?'" (No sweat; hundreds of reporters were at that moment tailing Mr. K. around the United Nations.)

The international situation, despite Khrushchev's vaudeville act at the U. N., was quiet.

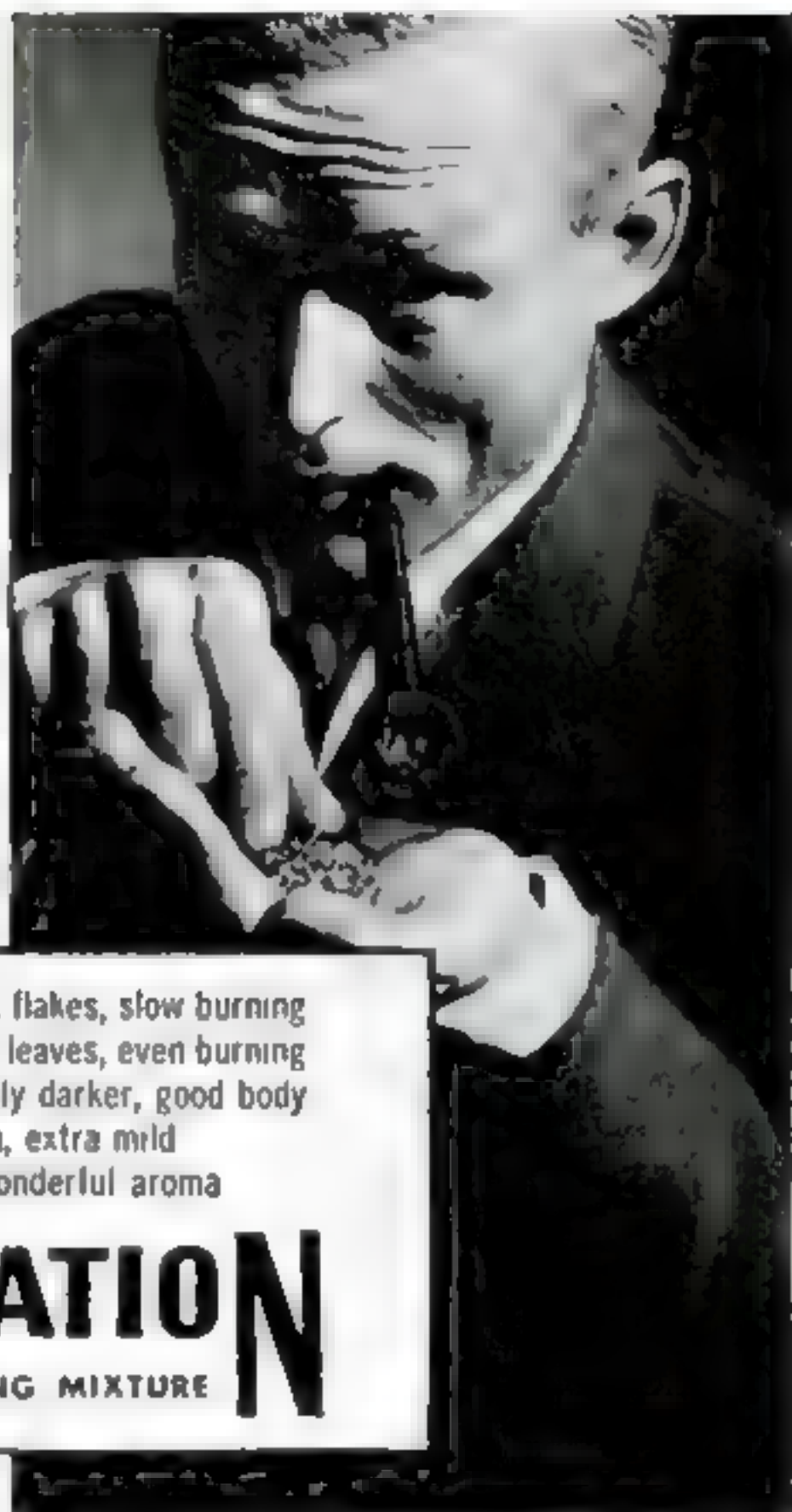
The air-breathing threat—unidentified airplanes—was remarkably low. The screen showed only two unknowns.

But most important, BMEWS was acting exactly as if it had made a mistake. Its magnificent computer, a triumph of engineering skill, could not be coaxed into calculating the path of the supposed missiles. It should automatically have punched out their launching site, target area, and arrival time. Not only did it refuse to do this, but it wasn't even cer-

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Could False Alarm Trigger Atomic War?
tain about their momentary location; the
azimuth kept jumping around.

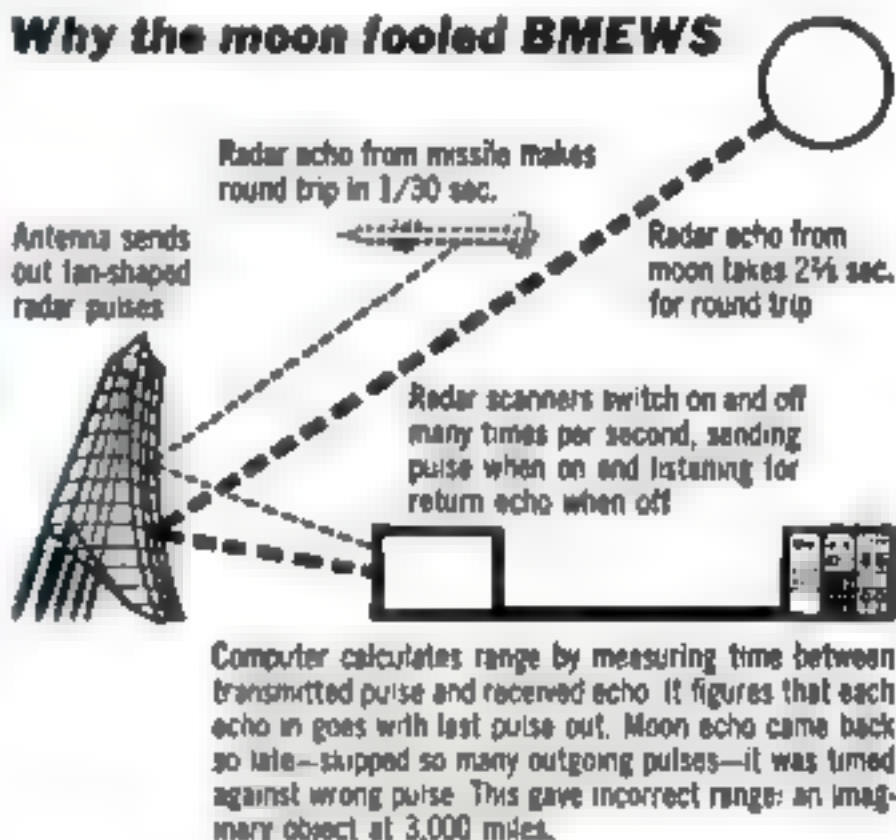
This *had* to be a false alarm. Fifteen
minutes passed, then 30. None of our
cities was missing. After 45 minutes of
feverish checking, the engineers had the
answer. To an outsider, it's funny.

BMEWS had seen the moon rising.

Its giant radar antennas, each bigger
than a football field tilted on edge, had
been designed to detect missiles 3,000
miles away. No one ever expected that
they would pick up the faint radar echoes
reflected by the moon 240,000 miles away.
They did.

Astronomy lesson. These echoes had so
far to travel that they came back late,

Why the moon fooled BMEWS



and out of step. This fooled the com-
puter, because it hadn't been told about
the moon. Every few seconds a new moon
echo would come in, looking to the com-
puter like the echo from still another
missile at 3,000 miles.

The BMEWS computer has now been
taught enough elementary astronomy to
recognize the moon—and ignore it.

Well-organized plans for thwarting
false alarms worked perfectly on October
5th. The alert never got beyond the call-
in-the-Battle-Staff phase. Does this mean
the world is safe? Not exactly.

Reluctance to spread false alarms
might let a clever *real* attack get through.
Military men prize their ability to keep
calm. Quite often they have kept calm
too long. We ignored the fluke radar
warning of Japanese airplanes at Pearl

Could False Alarm Trigger Atomic War? Harbor. The Nazi high command, refusing to believe that the D-Day invasion was the real thing, delayed a counter-attack for fatal hours.

And complicated false alarms may be a serious hazard. There have been several false alarms involving bomber attack, including at least one that scared the pants off a number of people.

The night of April 16-17, 1952, started out with frightening intelligence reports. And then came this sequence of events:

An Eskimo on Nunivak Island saw contrails—the tracks of vapor left by high-flying aircraft.

The telephone lines to Alaska went dead.

Five unknown airplanes were spotted over Presque Isle, Me.

That night the generals woke up President Truman at 3:30 a. m.

(The unknowns over Presque Isle were our B-47s, off course. The communications failure was just a failure. What the Eskimo saw is still a mystery.)

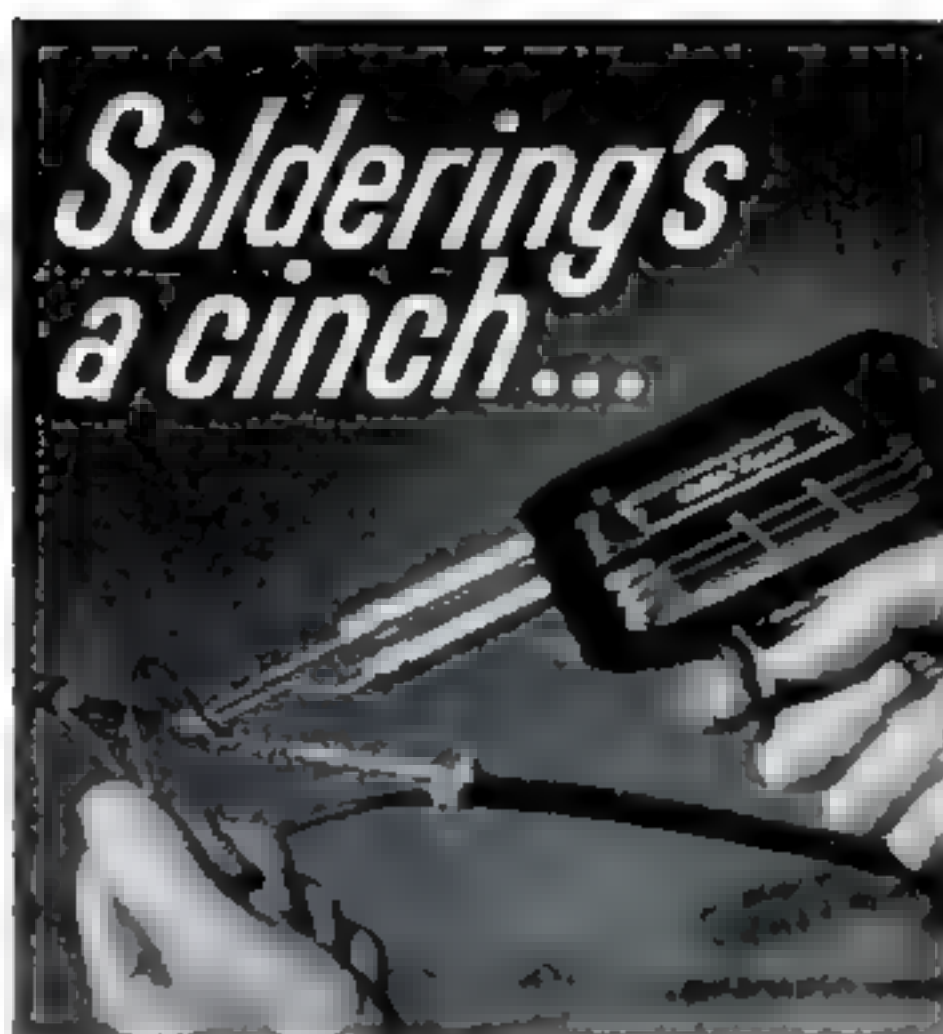
Today such a false-alarm combination—mistaken sightings, coincidental black-outs, international tension—would be much more dangerous, simply because there is so much less time to make a decision.

Historic precedent. If this sounds worrisome, you can find some comfort in the record of history. Herman Kahn, for his fascinating book, *On Thermonuclear War*, could dig up only one historic example of a conflict set off by a false alarm. And that one is a myth: The Battle of Camlan in the King Arthur legend.

The story goes that King Arthur and his Round Table gang met Modred and the bad guys at Camlan to arrange a truce. Both sides were armed to the teeth and wary of sneak attack. Then one poor knight got bitten by a snake and pulled his sword to kill it. That triggered massive retaliation.

Thomas Malory, who wrote *Morte d'Arthur* when gunpowder was the ultimate weapon, explained specifically why the Camlan false alarm caused mutual annihilation: In the unplanned, unorganized battle—they fought to the death.

The world is entering a Camlan era now. But alert soldiers and intelligent diplomats can make sure that a Camlan war remains a myth.



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Only Weller has Dual Heat! 2 trigger positions give low 90-watt and high 125-watt heat as your job requires. Tip heats instantly, has superior heat transfer and long reach. Spotlight eliminates shadows. Result... soldering is simple, sure and fast. Kit includes cleaning brush, soldering aid and solder.

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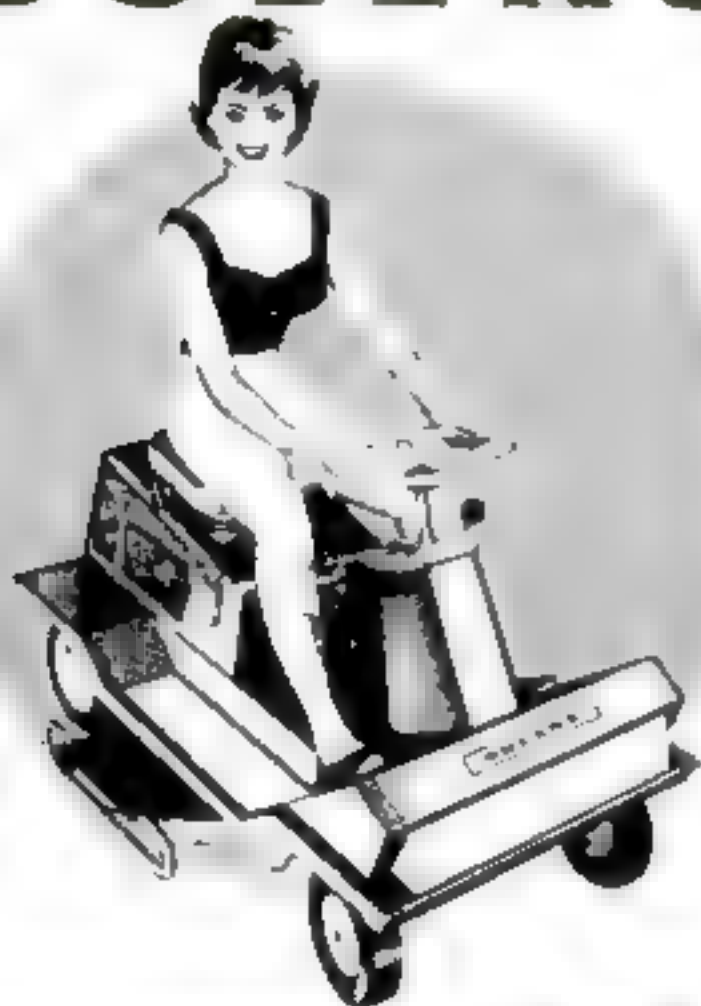


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● Send 25¢ for Illustrated Refinishing Manual
Write for free Wonder-Paste folder
Wilson-Imperial Co., 121 Chestnut St., Newark 5, N.J. At paint and hardware stores

Dial "O" for Help

[Continued from page 86]

In Englewood, Colo., a three-year-old told the operator, "Grandma won't wake up." The operator notified police. Grandma had died of a heart attack.

In Madison, N. J., a two-year-old telephoned, "My aunt is sick." Oxygen, administered by police, eased the effect of a stroke and saved the woman's life.

Operators often add quick-wittedness to the standard emergency system.

In Chicago, an operator plugged in to hear a man choking. "Room's full of fumes," he gasped. "I'm too weak to open the door or the window."

"Throw the telephone through the glass," she suggested.

He did. Fresh air gushed in.

In Hollywood a man told the operator he would like his telephone disconnected, but first wanted to make a "last call." The operator got suspicious. The police she notified rescued a would-be suicide from an overdose of sleeping tablets.

In Spring Valley, N. Y., a subscriber asked the operator to call the fire department to put out a fire in his stove. She did. Then she suggested, "Try throwing salt on the fire." When the fire ladders arrived, the blaze was out.

Bell backs it up. Dialing "O" for help is an injunction from the Bell System and its associated companies that they implement with a widespread educational campaign. Ten years ago they initiated courses in emergency calling among school children.

The number of holocausts and murders reported in these practice calls on dummy equipment would give the shudders to even a crime-hardened TV detective.

A lot of "emergencies" just aren't.

A telephone gets knocked off its hook or cradle. If it's a manual answering service, the operator listens for "home sounds." If things seem normal, she telephones a neighbor to have the receiver put back.

Subscribers dial "O" to ask how to spell s-e-p-a-r-a-t-e, or to inquire at what age kangaroos wean their young.

Inevitably, every so often, a subscriber dials "O" to complain that he has been getting a busy signal on an emergency call for the last 30 minutes. The operator checks. It's been busy, all right—he's been dialing his own number.

Answers to PS Puzzlers on 24 and 33

Rollers. 44 inches. If a roller simply revolved in place (say in mid-air), it would still move the block 22 inches forward. But the roller is moving along the ground at the same time—the distance of its circumference. That's another 22 inches. (Circumference = $\pi \times$ diameter.) Any number of rollers placed under the block and moving together produce the same advancement. (Try it with pencils under a match box if you don't believe it.)

Balls in urns. Just one drawing is necessary—from the urn labeled "One white, one black." If you draw a black ball, you know (because the label is incorrect) that this must be the "Black-black" urn. Then the urn labeled "Black-black" must contain white-white and the "White-white" urn contains black-white. Similarly for the other case.

Diophantus. With all those fractions, you might guess you're looking for a number that the denominators divide into evenly. You'd be right if you guessed 84. Here's a straightforward algebraic solution, however, with X equalling Diophantus' age:

$$\frac{1X}{6} + \frac{1X}{12} + \frac{1X}{7} + 5 + \frac{1X}{2} = X - 4$$

Multiply both sides by 84:

$$14X + 7X + 12X + 420 + 42X = 84X - 336$$

$$756 = 9X$$

$$84 = X$$

Eggs. Shucks—he keeps ducks.

Sick souls. At least 27 of the people must have had all three ailments. Figure it out in steps:

There were 85 who had colds, 79 who had flu. The minimum overlap is $85 + 79 - 100 = 164 - 100 = 64$. (You can also look at the problem geometrically. Imagine a line segment 100 units long. Count down 85 from one end, 79 from the other, and measure the midsection where they overlap.) Now take that 64 and overlap it with the 63 Virus X victims: $63 + 64 - 100 = 127 - 100 = 27$.

Karts. Because the track is an oval, the same number of cars are spread out around the track in front of Johnny as behind him—all the other cars in the race. If we let n = that number, then $n + 1$ will be the total (including Johnny's kart). To find n you can solve this equation:

$$\frac{1}{3}n + \frac{3}{4}n = n + 1$$

To get rid of the fractions multiply both sides of the equation by 12:

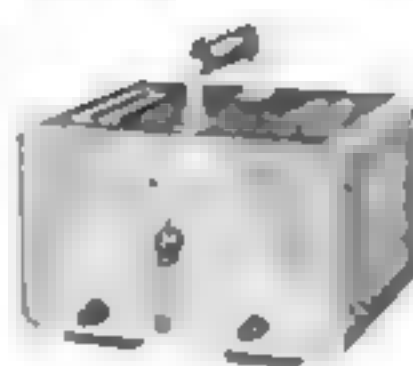
$$4n + 9n = 12n + 12$$

$$13n = 12n + 12$$

$$n = 12$$

So there are 13 karts in all.

The Miracle of Transistors Brings You



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Compact, Rugged, Truly Portable

The compactness of the ESB ACTIVERTER design makes it possible to have a 12 Volt storage battery, an inverter, and a battery charger all in one self-contained and portable package. Our PAK-O-POWER ACTIVERTER model provides a source of 110 Volt AC, with an output rating of 500 Watts, in a package the size of a portable pencil case! Because solid-state electronic components are used throughout, ACTIVERTERS are both rugged and lightweight. There are no moving parts, no vibrators.



4 Sizes—from 150 to 500 Watts

MODEL I-152 INVERTER Inverter only, operates from direct connection to 12 Volt battery or through cigarette lighter socket of cars with 12 Volt systems. Output ratings: Intermittent Use—150 Watts, 1.5 Amps AC; Continuous Use—125 Watts, 1.2 Amps AC. Shipping Weight: 8 lbs.

MODEL IC-282 ACTIVERTER Inverter-Charger operates from direct connection to 12 Volt battery. Output ratings: Intermittent Use—200 Watts, 2.3 Amps AC; Continuous Use—200 Watts, 1.8 Amps AC. Shipping Weight: 15 lbs.

MODEL IC-303P PAK-O-POWER Inverter-Charger with compact unit for 12 Volt battery. Completely self-contained unit. Output ratings: Intermittent Use—200 Watts, 2.3 Amps AC; Continuous Use—200 Watts, 1.8 Amps AC. Shipping Weight less battery: 22 lbs.

MODEL IC-506S PAK-O-POWER The Multi-Service Inverter-Charger—start unit with large 12 Volt battery compartment and car start leads. Completely self-contained with built-in fast and slow charger—charging rate 60 Amps for 6 Volt and 40 Amps for 12 Volt batteries. Output ratings: Intermittent Use—500 Watts, 4.0 Amps AC; Continuous Use—300 Watts, 2.5 Amps AC. Shipping Weight less battery: 55 lbs.

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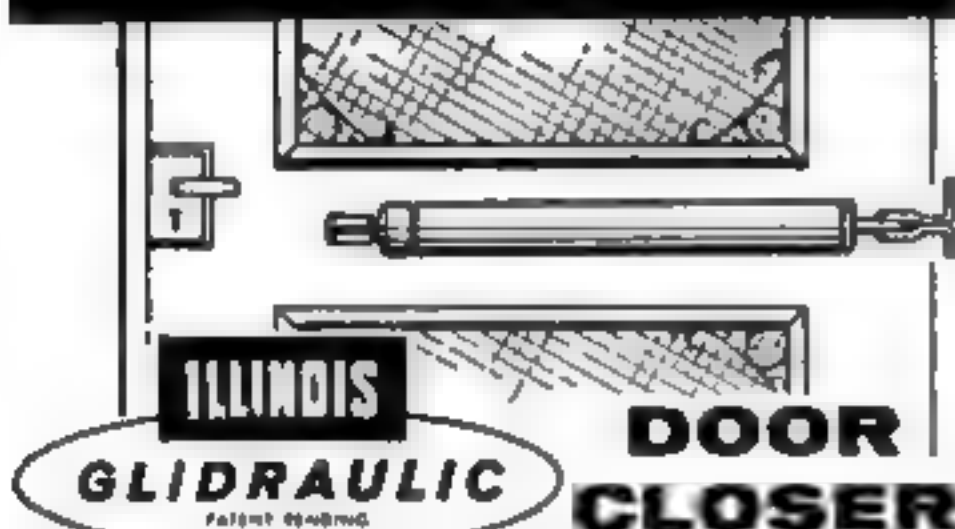
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307-13 W. HINTZ RD., WHEELING, ILLINOIS

The World's Biggest Auto Accident

[Continued from page 93]

Gracie Johnson. At that moment she was about opposite the first pile-up, nervously piloting her new Chevrolet through the murk on the southbound side. She was taking her 11-year-old son and 8-year-old daughter to Berkeley for Thanksgiving.

"It was an outing intended to take my mind off my troubles," she remarked wryly.

Their car had rolled out of the sunlit hills and plunged into the white shroud. "Ooh, this is fun!" cried the youngsters, who had never ridden through fog before.

Gracie hoped to find a turnoff and sit the fog out over coffee in a roadside cafe. But she had never been on this road before. Now she couldn't even see it. All she could do was follow the tail lights of the car ahead. As bad luck would have it, they led her down the left-hand lane.

When the appalling din of collision came tumbling out of the blank mist at her left, the tail lights ahead abruptly halted.

Gracie stopped, too. Then, in the dim glow of her headlights, she was astounded to see a man emerge from the car up front, cross the divider, and disappear in the direction of the hidden wreck.

Rolling down her window, Mrs. Johnson yelled into the fog, "Hey, Mister, come back! Don't stop there! We'll get hit."

Frantic, afraid to back up and blindly work her way around the car that blocked her path, she began blowing her horn and pumping her stoplights to warn away other vehicles. This worked for a moment. The next southbound car crept up behind her and stopped.

Hardly had it halted, however, when it was slammed from behind and flung headlong into Gracie's Chevrolet.

The children were thrown to the floor. Gracie's head was yanked back so brutally that her glasses flew off and landed on the back seat.

In a frenzy, she turned around to the children, who were tumbled on the floor. At this instant, another car struck the end of the telescoped line and tumbled them all again. This happened twice more.

The little girl, whose chin had smashed against the ash tray on the back of the front seat, was now crying hysterically.

CONTINUED

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FRESH WATER SYSTEM PUMP - For boats, campers & trailers. Output from 10 to 300 gal. an hr. Variable rheostat controls output. 1/2" pipe thread into bronze impeller housing. Radio noise filter. 5.2 amp. draw. Explosion proof construction. Shipping wt. 11 lbs. Complete with mounting instructions & wiring diagram. Approx. GOVT COST \$200 NEW \$10.95.



CHRONOMETRIC TACHOMETER Built to U. S. Navy & Air Force specs. Jaeger Watch Co. For counting revolutions per min. of any rotating shaft. Can be used on speeds up to 10,000 RPM. Accuracy to 1/10 of 1%. Complete with male and female tips and leatherette hand case. GOVT. COST \$87.50. LIKE NEW Only \$10.95 odd.

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50 K. Generator rated above can be purchased separately. Makes deluxe heavy-duty welder comparable to the finest commercial welders available. Wt. 90 lbs. Approximate GOVT COST \$400. Gen. alone - \$49.95.

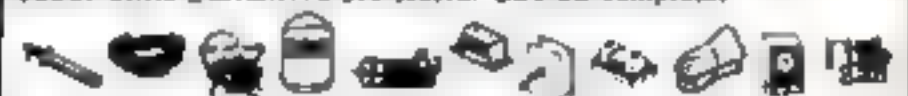


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"DELUXE 11" ARC WELDING KIT Consists of 200 AMP Gen., voltage reg., ammeter, float adjustable helmet, electrode holder, pr. welder's gloves, 30' welding cable, reactor coil, toggle switch, rheostat. Approx. GOVT. COST \$650. Units guaranteed pre-tested. \$34.95 complete.



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The World's Biggest Auto Accident

The boy was white with terror. Yet Gracie didn't dare take them out of the car while she could still hear crashes occurring behind her.

Caught in the middle. "The worst part of it was waiting for the accident to end," she said later. "It seemed to go on forever. We were helpless, and right in the middle of it."

Only minutes had elapsed since the nightmarish crash had begun on the other side of the highway. That was long enough, however, to have caused traffic congestion in the southbound lanes, and an ominous absence of cars in the northbound lanes.

The Toll Plaza at the bridges reported these facts to the California Highway Patrol. A patrolman roared down the road to investigate.

In a few minutes, his excited voice was heard on the police radio. "Send every man you can spare, and every ambulance and tow car you can get," he yelled. "There's been a terrific crash."

When he had worked his way past the stalled southbound traffic to the nearest edge of the accident, he first saw a flare blazing weakly in the middle lane. Then a man ran toward him along the divider, waving his arms and shouting.

"I didn't stop to find out what he had to say," the patrolman recalled. "But I soon knew what the shouting was all about. I've never seen another sight like it. There was total chaos."

As far as the fog allowed him to see, pried hoods and sprung trunk lids gaped at him like so many mouths open in astonishment. Rear ends rose at peculiar angles. Engines looked like metal accordions. Giant fingernails of metal that had been clipped from fenders and doors were scattered across a powder of pulverized glass. Torn luggage and its incongruous contents spilled out of broken trunks.

Battleground. Some people were laid out on the pavement, with anxious groups bent over them. Others, with smudged and bloody faces, were hobbling toward the steep banks of the cut. A few stood disconsolately among the ruins as if held there by a current too strong to break.

There were several persons with broken legs, two with broken jaws. Fearful cuts, bleeding head wounds, and pulpy abrasions were numerous.

The World's Biggest Auto Accident

Seven patrol cars had screamed southward from Vallejo in response to the radio call for help. Five civilian ambulances and one of the Navy's soon headed for the Big Cut. A half-dozen tow cars got rolling. The Vallejo Fire Department sent a pumper to wash down the highway, a river of spilled gasoline. The Vallejo police dispatched a squad to help guide the stream of ambulances through traffic.

Twenty-four cars had suffered major damage in the wreck. Three had been comparatively fortunate. The last seven to hit the main pile-ups had received such light blows that no one in them was hurt. They were allowed to go their ruffled ways to Thanksgiving dinner.

Among the missing. The police couldn't find either of the two villains of the piece. The driver who had triggered the crash in the northbound lanes had never stopped moving. The man who had so irresponsibly parked ahead of Gracie and precipitated a 14-car free-for-all in the southbound lanes had returned to his car and disappeared. Fortunately for Gracie, a fire chief whose car had been damaged near hers confirmed her story.

Within 15 minutes after the highway patrolmen arrived at the scene, the fog disappeared completely. Within two hours, holiday traffic was moving freely again through the Big Cut.

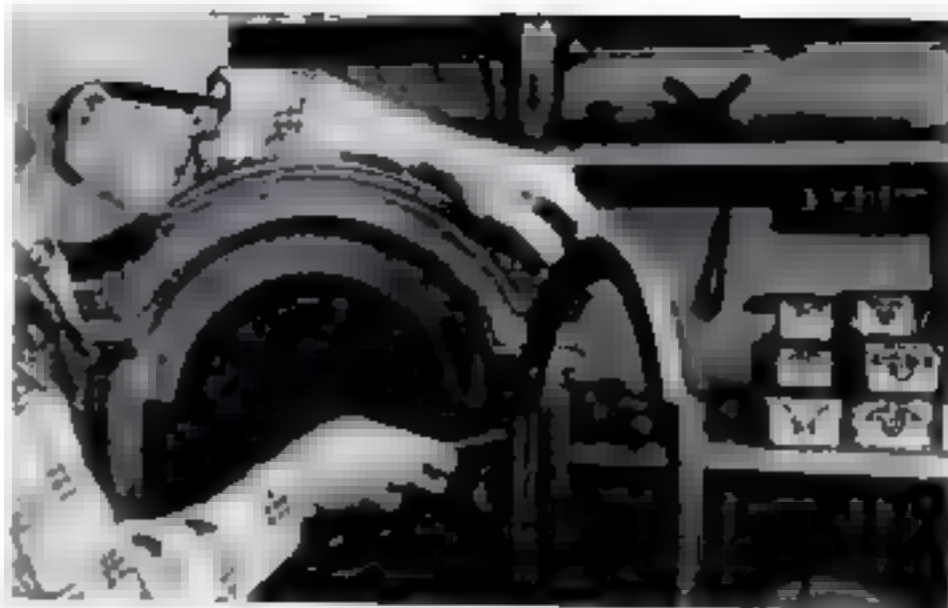
Mrs. Johnson seemed to be unharmed, and her car would run, although its trunk was unrecognizable and filled with powdered glass from headlights, its right rear fender was in shreds, and the gas tank looked as if a horse had kicked it.

"We're darn lucky not to be hurt," exclaimed the driver of the car behind hers as they watched the wreckers at work. He then attempted to flick his cigarette lighter—and found that his thumb was broken.

Gracie drove the 90 miles back to Folsom, and to "a month of pain pills and tranquilizers" for a neck nerve injury that she didn't feel until the following morning.

She'll never forget what the lady next door said when she saw the battered car enter its home driveway on Thanksgiving afternoon.

"Gracious, Gracie," she hollered. "What on earth did you back into?"



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vived two forest fires, a kick by a horse, and collision with a cart.

In Key West, Fla., turtles are one of the biggest attractions. In that center of the soup interests, some 5,500 turtles are rounded up each year by one turtle boat alone, the A. M. Adams. The 300-pound beauties, worth \$75 each, are on view in turtle kraals, where they're kept until slaughtered.

But this quest for soup meat and combs has been hard on the race. "The green turtle is in trouble," says University of Florida biologist Dr. Archie Carr. Once vast hordes of them grazed in great pastures of turtle or manatee grass. But large numbers have been captured at sea, females have been taken at night as they came out on beaches to make their nests, and nests have been robbed of their eggs.

"The fact that green turtles have survived at all indicates that they are an uncommonly tough breed," says Dr. Carr. Today, instead of six important nesting areas around the Caribbean, the green turtles have only one 22-mile stretch along Costa Rican sand.

Dr. Carr has already taken the first steps to bring the turtles back to their ancestral beaches. A few years ago he published *The Windward Road*, a book of his turtle-tracking adventures in Caribbean waters. The Costa Rican government thereupon set aside two miles of turtle-nesting beaches as a sanctuary and laboratory for Dr. Carr's studies. Last year three more miles were added.

Operation Egg-Lift. But there's a biological hitch: Turtles won't return of their own accord to an abandoned beach. The females lay eggs only where they themselves hatched.

Dr. Carr had the answer to this: He and his co-workers collected 30,000 eggs from known turtle-nesting beaches. These eggs were flown to a dozen former nesting sites and deposited in the sand in what Dr. Carr calls "incubators"—areas of beach protected from hogs, dogs, buzzards, and people.

The eggs hatched in the sand and some 12,500 baby turtles went to sea. If all goes well, they'll return to the new beaches to raise the next generation.

Most exciting to Dr. Carr is how the turtles will find their way back. "Turtles

can be dumped in the middle of the sea, where they can't see the bottom or mountains or anything, and go right to their destination," he says.

Marked turtles that escaped from pens at Tampa have been taken a second time from their native waters by Mexican fishermen. To get back home, some of them had to travel 1,100 watery miles. How they do it is a mystery. Dr. Carr thinks they may steer by the stars.

To collect the loose ends of this puzzle, a scientist must track turtles through the trackless sea. This is not as easy as banding birds. Dr. Carr is trying it by attaching strings with colored balloons to the turtles' shells. As long as he can keep these in sight he can take course readings on the animals.

Ship-to-turtle radio. Meanwhile, if balloons won't lead him as far as he wants to go, Dr. Carr is prepared to use expensive electronic equipment. He has experimented with small radio transmitters attached to turtles' shells. Once he has a turtle sending out signals, he can pick them up from a following boat.

Dr. Carr's research with turtles has attracted attention from other conservation workers who want to help bring the sea turtles back. This should be good news for fishermen.

How to trap a turtle. Turtle catchers rely on nets to take most of their catch. But some natives risk life and limb to jump into the sea and wrestle them. If they hold the front of a turtle's shell high he can't dive.

When Columbus returned for his second look at the New World, so historians say, he found islanders catching turtles with the help of fish—remoras, or shark suckers. This is a brand of underwater falconry, still practiced.

The fisherman attaches a ring to the remora so it won't slip over the fins. He ties a rope to this. When he sights a sleeping turtle he releases his fish. The fish locates the turtle and attaches itself to the plastron. It holds on so tightly that the fisherman can tow the struggling turtle right up to the boat.

Most turtles are gentle by nature. The real exceptions are the snappers. They're evil-tempered from egg to soup bowl.

The biggest of this clan is the alligator

Nature's Most Successful Animal

snapper of the Mississippi Valley. It averages about 100 pounds and measures two feet across. Toothless, their sharp beak and trap-like jaws are formidable.

The snapping turtle, a notoriously poor swimmer, spends much of his time lying in ambush on a lake bottom. His shell is fine camouflage in water. He opens his gaping mouth and sticks out a long, ribbon-like tongue that looks exactly like a fishing worm moving gently with the current. A hungry fish has trouble resisting the lure. If he nibbles, he seldom

gets away: The snapper strikes with the speed of a rattlesnake.

How do you pick up a snapper? By the tail. But hold him well out from your legs. He's a hard gripper.

Recently in Alexandria, Minn., a 15-pounder grabbed the hand of a 10-year-old boy. Doctor, police, and firemen worked frantically to pry loose the turtle's jaws. But with no luck. Finally a commercial turtle buyer was called.

How did the expert free the victim? He tickled the turtle with a feather.

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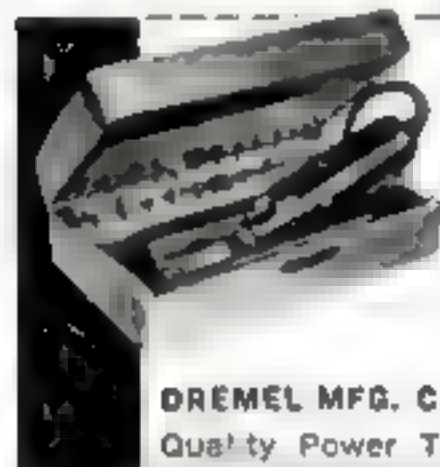
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Here Come Super-Hot Power Lines

[Continued from page 131]

they enclose ends of switch blades, tops of insulator stacks, clamps for wires.

It's "handle with care" in putting up EHV wires—nicks evoke corona. So do raindrops, snagged leaves, even pollen.

Beyond a certain voltage, a whole wire lights up with corona. The bigger the wire, the more voltage it can take before it "leaks." That's what has set the sizes—nearly 1½-inch and up—of wires for voltages in the EHV range. (If they're corona-free, they're also big enough to carry the current.) And their whopping size has a novel result:

"Pipes" become wires for EHV. As a conductor grows in size, alternating current concentrates near the surface. And since it shuns the center of EHV's big wires, they leave the center out.

A copper tube, of 1.4-inch size, was the wire for the first EHV line—the 287,000-volt one from Hoover Dam to Los Angeles, which held the world's high-voltage record from 1936 to 1952.

Later U.S. hot lines use "pipes" of aluminum, called expanded conductors. They carry current in one to three outer layers of aluminum strands. A steel-cable core adds strength. In between are aluminum tubes, in an experimental all-metal design; or a paper-twine filling, plus a few aluminum strands to bond outside to core, in the standard design.* This type ranges from 1.4-inch, for about 280,000 volts, up to the record 2.32-inch, for around 460,000 volts.

Still growing? None is big enough, though, for coming voltages. It was the 2.32-incher that hissed and glowed in GE's opening show—and experts think it's the biggest wire that ever *will* be made. Insulation is no answer; a coat of insulating varnish, say, would only abet corona as a wire's stretching and heat cracked it. How will they get to 750,000 volts, then?

They'll turn from "pipes" to "cages," they say. For single wires, they'll substitute multiple ones, which they call bundle conductors.

Sweden pioneered it in 1952 on a 1,600-mile line of 380,000 volts, a new world record at the time. Each conductor was a pair of 1¼-inch wires, 18 inches apart, linked by metal spacers.

Cage-shaped bundles of three to four

Here Come Super-Hot Power Lines wires handle higher voltages. Today's highest-voltage operational system, a Russian 500,000-volt one, uses a cage of three 1.19-inch wires. A cage of four of them will carry GE's 750,000 volts.

By giving the effect of an ultra-large wire, a bundle suppresses corona. Real star of GE's show was a length of its four-wire "cage" feeding each big wire—and carrying the same 700,000-plus volts without making any fuss about it.

Prankish EHV. Static and magnetic fields around hot lines play strange pranks. A tingling spark may leap, report workers on GE's line, if you touch a man next to you. Birds, it's said, won't come near an EHV wire—static ruffles their feathers.

For the ticklish job of repairing a live hot line, a lineman dons special shoes. Conducting soles drain his body of electrical charges induced by the wires. Precision-drilled in a task like replacing a damaged insulator element, crews manage it from a perch on a tower with long "hot sticks." The daring technique—to avoid interrupting power—is called feasible even at 460,000 volts. Above that, they don't yet know.

Wireless light. Simply by induction, a neon airplane-warning beacon lights up when it's hung on a line—a useful trick where no low-voltage current is handy.

Live EHV wires can become so alive, from electromagnetic forces, that they violently thrash about. Wires strung 16 inches apart actually wrapped themselves around each other when Detroit Edison hurled 19,000 amperes through them to simulate a short circuit. Spacers of bundle conductors must be able to take a sledgehammer blow of 500 pounds' force from gyrations of wires, the tests showed.

When a fiery arc crashes between live wires, or wire and tower, that's a short circuit. Tripped into action, a circuit breaker cuts off the current in a split-second race to avert damage to the line.

Safeguards against shorts are EHV's huge insulators and air gaps—a 15-foot clearance between wire and tower, for 750,000 volts. That far exceeds the gap the voltage can jump, for good reason:

Lightning, striking a line, can leap farther through air—and blaze an ionized, conducting trail to earth that a runaway power current follows. So can lightning-

CONTINUED

What the "oil-burning" engine is telling you



No mechanical part will last forever. By the time you have driven your car 50,000 miles, the crankshaft in your engine will have made 150,000,000 revolutions. Piston rings will show signs of wear. Engine bearings will wear, too, and your engine may begin to burn increasing amounts of oil.

Worn bearings — sluggish performance

Main, connecting rod, and camshaft bearings control the oil flow inside your engine. As bearings wear, they leak excessive amounts of oil, and this oil—up to 25 times the normal amount—is thrown violently against the cylinder walls. It slips past piston rings into the combustion chamber where it burns to heavy carbon and varnish. Rings become clogged and deposits build up on valves. Your car burns oil, gas mileage drops, and performance becomes sluggish.

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Here Come Super-Hot Power Lines

like "switching surges," of twice-normal voltage or more, that momentarily race through a line when connections are broken and made. Protection from both requires the extra gap.

About all these things and many more, researchers will ask GE's line more than 10,000,000 questions a year. That many readings will come from 158 automatic instruments—at 20-minute intervals in good weather, two-minute ones in bad.

They hope for thunderbolts, sleet, gales, while they're taking their line's pulse. If nature doesn't come through with lightning hits, a 3,200,000-volt artificial-lightning generator will.

Ahead for EHV. Earlier experimental EHV lines, of 500,000 volts, have been in use at Brilliant, Ohio, and Leadville, Colo. A new one of 750,000 volts, matching GE's top voltage, is due to be opened in mid-1961 at Apple Grove, W. Va., by American Electric Power Service Corp. and Westinghouse. All these lines are short (1½ miles or less). And they are "open-ended"—their far ends aren't connected to anything. GE's team will start that way; but they expect to learn more, before they're done, by transmitting power, too. Their program:

This year they'll run their line "open-ended," at 400,000 to 550,000 volts. They'll try the 2.32-inch wire, a bundle of two 1.46-inch ones, and a "Russian-style" bundle of three 1.19-inch wires.

Next year they'll go up to 550,000-to-750,000-volt range, reaching the line's maximum. To do it, they'll restring the line with bundles of three 1.46-inch wires, and then of four 1.19-inch ones.

Also in 1962, the remodeled line will be interconnected with Western Massachusetts Electric Co.'s nearby 115,000-volt transmission line, which supplies Pittsfield. Part of Pittsfield's power will be diverted from WMEC's line through GE's line, and back again at its end.

In 1963, by opening a circuit breaker, WMEC will sever its bypassed section. That will make GE's line an integral part of the WMEC system, and all of Pittsfield's power will flow through it.

Finally they'll spread out the findings and decide what to do next. One possible choice, suggests GE project director Dr. Pier A. Abetti: to rebuild towers and terminals, and go up to 1,000,000 volts.

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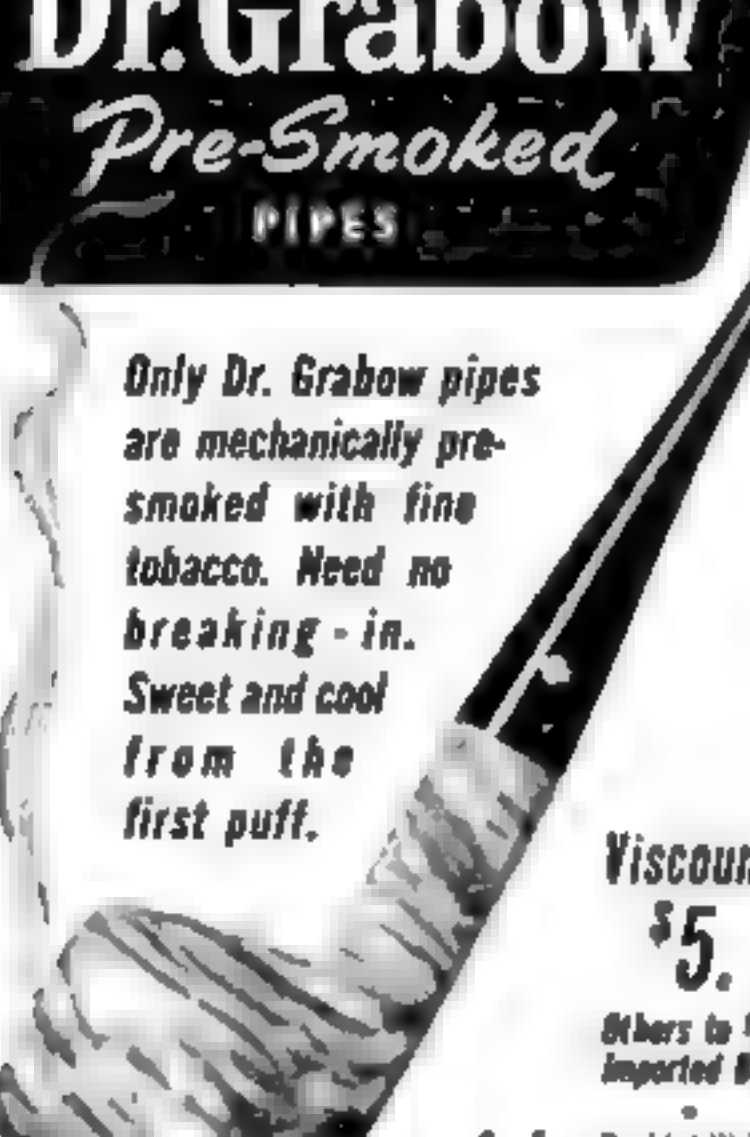
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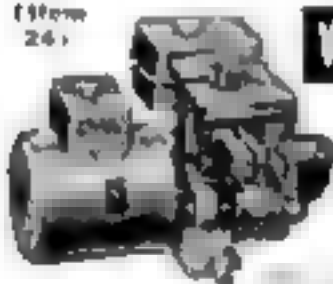
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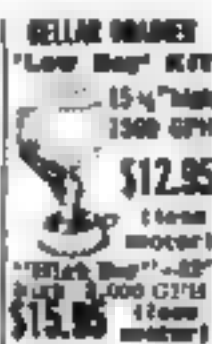
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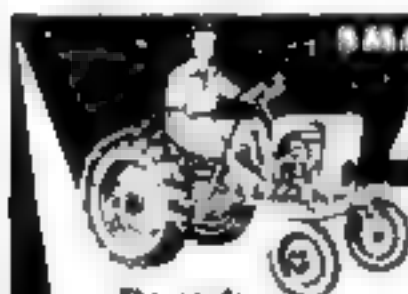
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[Continued from page 99]

In self-defense. At the same time tickling arouses us to complex reactions of pleasure and pain, it also triggers our defense mechanisms. Our ticklish spots are those where we are most likely to be injured. Dr. Sandor S. Feldman of the University of Rochester Medical Center, New York, believes that the palms and soles of the feet are especially sensitive because man's ancestors once walked on hands and feet, and through them was warned of danger.

The relationship of ticklishness to laughter is complex. The quiver of the cave man, first produced by fear and anxiety, may have developed into the larger body movement of laughter that even today can release us from anxiety.

But suppose the tickling is prolonged, not removing anxiety but producing it. Suppose the stimulus is something the individual can't brush away or control. Then ticklishness takes on grim proportions, and the expression "tickled to death" takes on new meaning.

According to anthropologist Margaret Mead, tickling was used as a form of torture by more than one civilization. The Chinese at one time coated the soles of victims' feet with honey and then brought animals to lick them.

Dr. Feldman speaks of people being tortured by tickling during religious persecutions in Cevennes, in southern France, in 1760. Some of these may have been tickled to death—by being thrown into fatal convulsions or suffering a heart attack from the strain of the ordeal.

Another authority notes that many Roman gladiators died laughing—a reflex action from wounds in the abdomen, a touchy part of the body.

But the experts agree on one point—no matter how much you laugh at your own jokes, or how conceited you are, you just can't tickle yourself.

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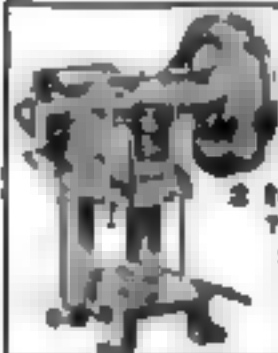
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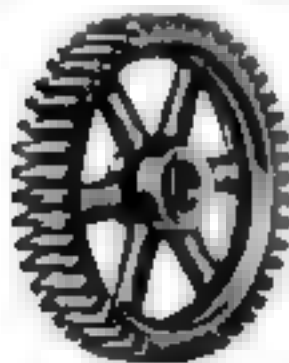
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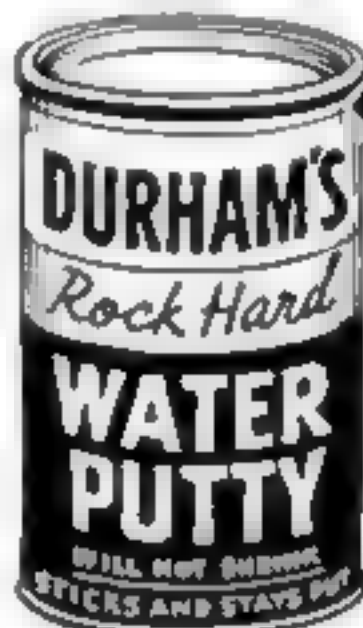
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How to Protect Your Valuable Ideas

(Continued from page 117)

through a factory making zippers or steel wool, for example. The machines that produce these things include unique, valuable—and unpatented—features that competitors would dearly like to know about.

The patent system—it has its flaws but helps most inventors

Are patents bad? The very idea of giving inventors a legal monopoly has been sniped at off and on ever since the Founding Fathers wrote it into the U. S. Constitution. (The closest call was in the 1870s, when barbed-wire inventor Joseph Glidden sued a competitor, won, and then threatened to sue every farmer who was using competitors' fencing. The farmers' screams were heard clearly in Washington.)

One fault charged against the system is the failure of the legal monopoly to end, as intended, when the patent expires. Some complicated inventions involve know-how, artful dodges, and tricks of the trade that can't be included in the patent description. Anybody who expects to manufacture nylon simply by following the instructions in Carothers' patent has rocks in his head. Dupont, nudged by the Antitrust Division of the Justice Department, had to provide teams of its own experts to set up a competitor in the nylon business.

Independent inventors, who are rarely lucky enough to win notice from the Antitrust Division, worry about the fate of simple patents. Smart lawyers can often break them.

One case that raised a storm was Ellis Turnham's very valuable patent on a grocery slider—the three-sided wooden frame that the clerk pulls along the checkout counter to bring purchases down to the cash register. The A & P fought this to the Supreme Court and won—just a combination of old ideas, the court ruled, and unanimously threw out Turnham's patent. Adding insult to injury, two justices said the invention was too simple a gadget to be worthy of a patent in the first place.

Despite such drawbacks, most inventors look on the patent system as a guardian angel. Their main complaint is that the Patent Office works too slowly.

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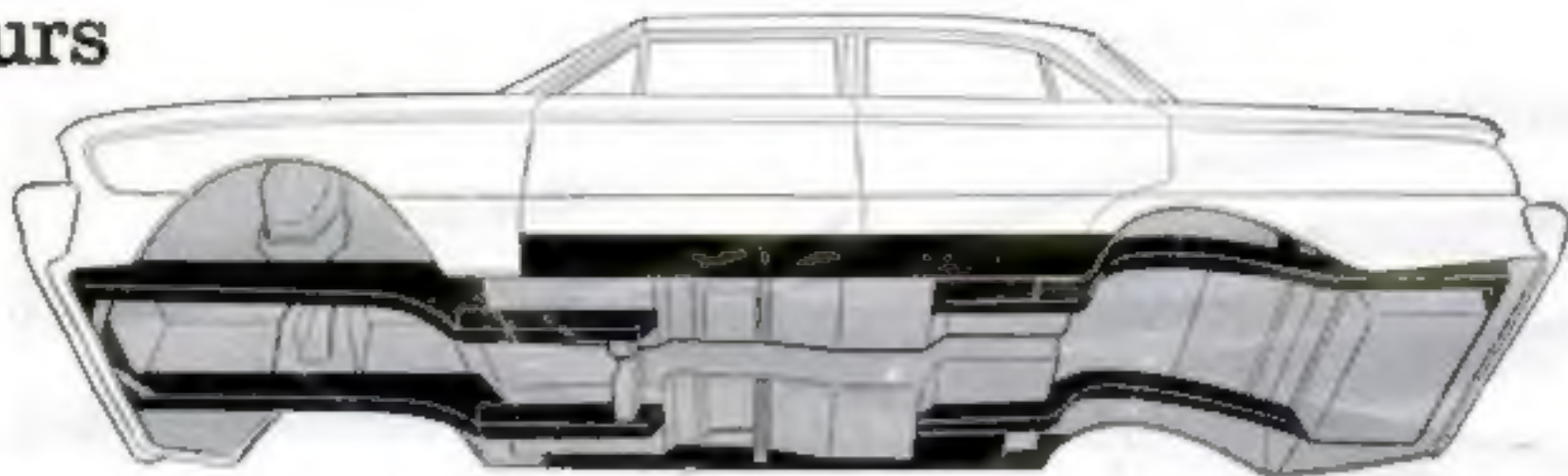
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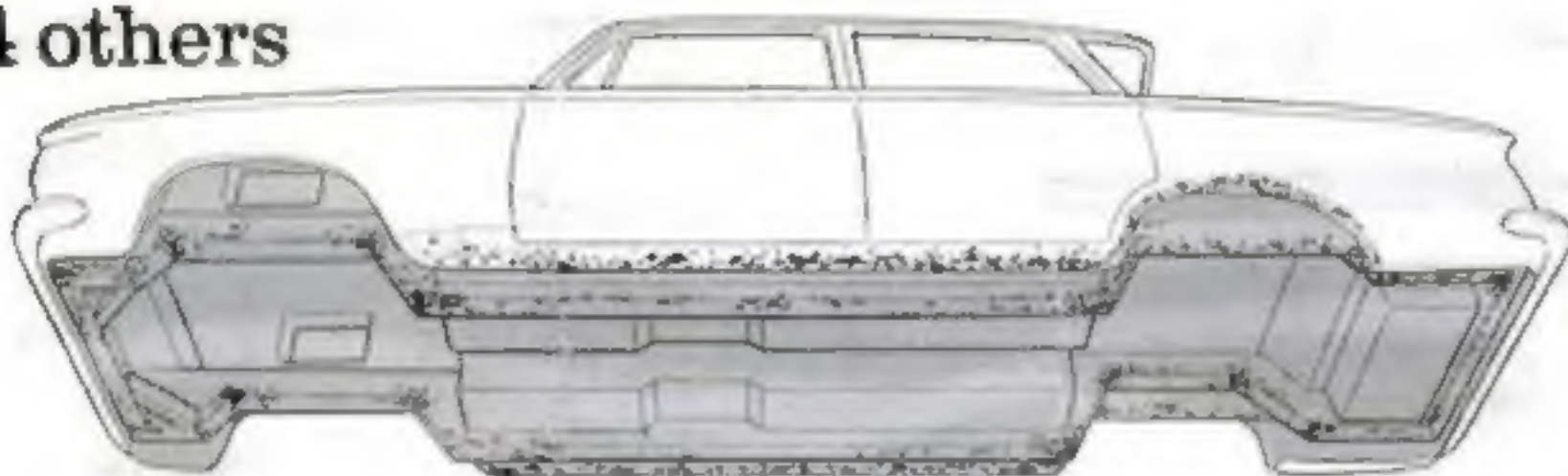
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Until recently, the weekend or vacation painter had to wait for an extended period of good weather. Now new "Dutch Boy" Latex can be used even right after a rainstorm. And it's specially helpful for the stop-and-go kind of exterior painting that most homeowners have to do. With this remarkable new paint, you can pick up right where you left off. Lap marks won't show. Skips and holidays can be touched up any time.

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